THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XC. No. 2197.] LONDON, JUNE 20, 1905. [57TH YEAR. PRICE 6d.

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— *ESTABLISHED 1830.* —

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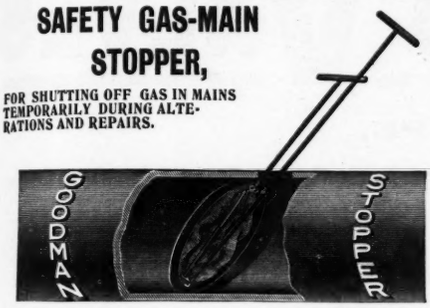
PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



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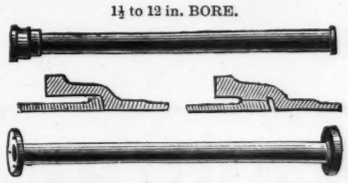

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ESTABLISHED 1848.

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FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

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CHEAP STEAM PRODUCTION.

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SIR,—Some years ago we attached forced draught and special fire-bars to our two Lancashire boilers, with the object of burning coke dust. The load has grown, and last week I had the water and fuel carefully checked, with the following results:—

Water used in boilers from Dec. 9 to Dec. 16, as per Corporation meter .	79,300		
Fuel used from Dec. 9 to Dec. 16: Coke	£	s.	d.
dust—41 tons 4 cwt., at 1s. 11d. .	3	19	0
Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

Yours truly,
C. D. LENG.

High Street, Sheffield, Dec. 19, 1904.

FOR FURTHER PARTICULARS APPLY—

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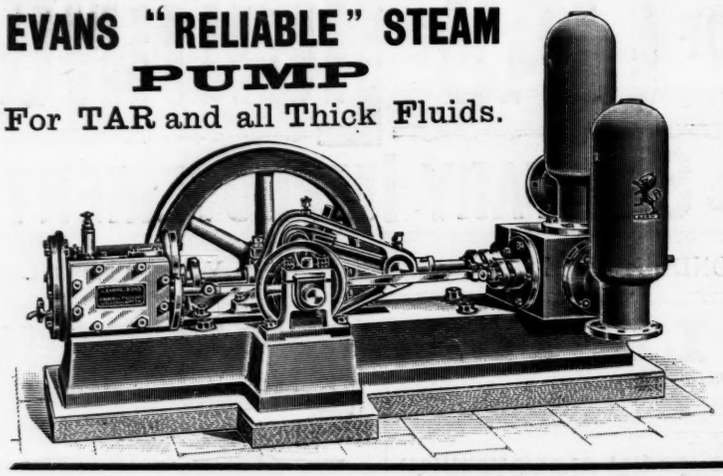
For TAR and all Thick Fluids.



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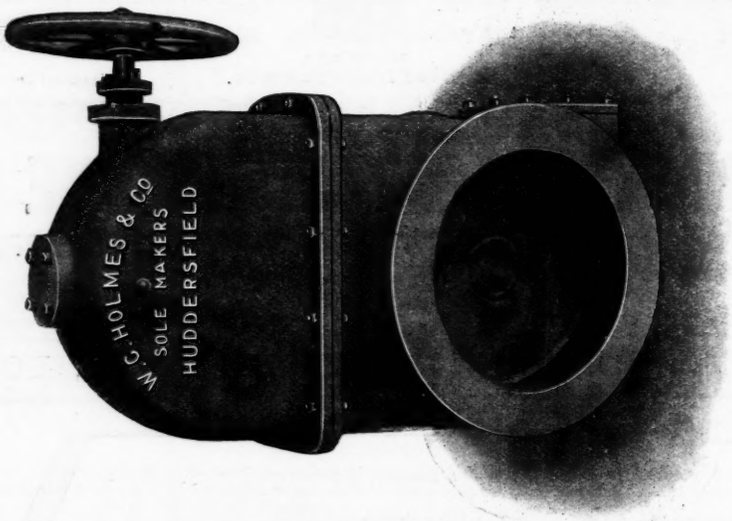
"WESTERN" TYPE,

MADE IN HORIZONTAL OR VERTICAL FORM from 3 in. to 48 in.



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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

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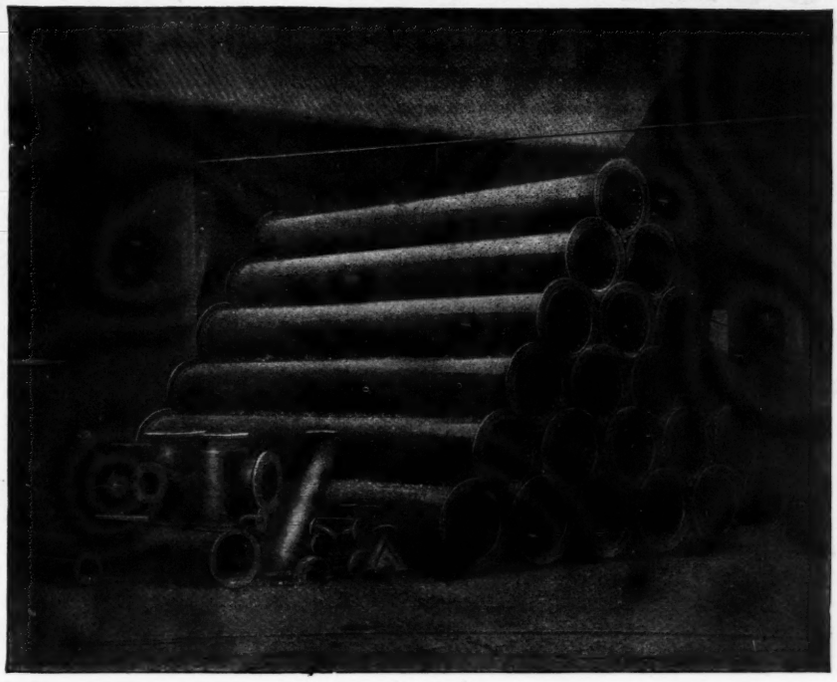
London Office:
63, QUEEN VICTORIA ST., E.C.

Gas Plants, Roofs, Retort-Fittings, Etc.



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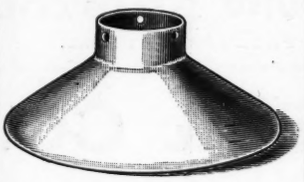

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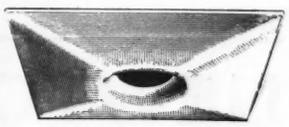

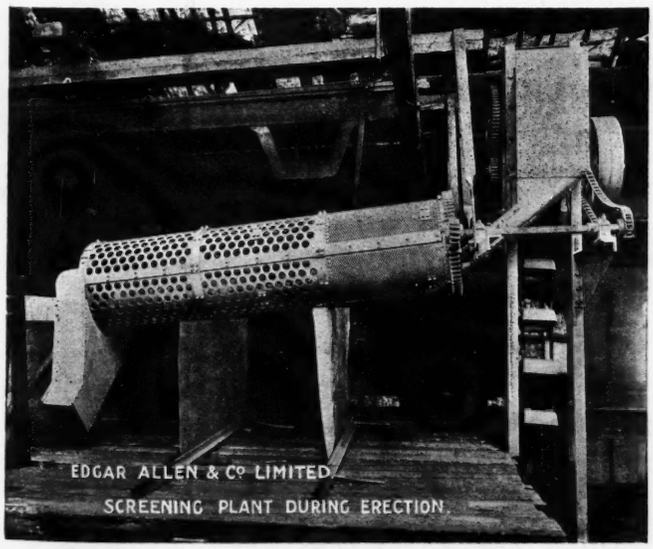

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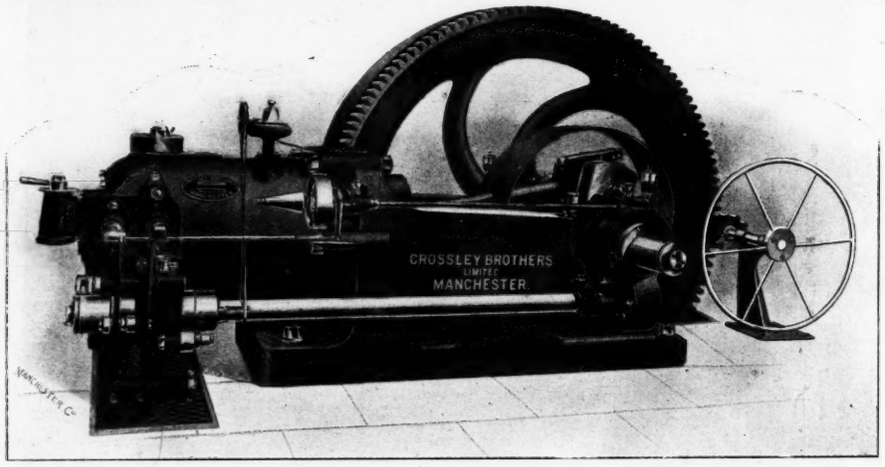

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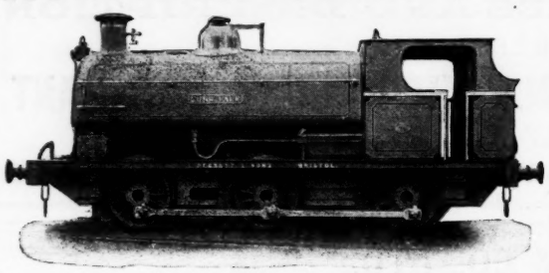

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Adequate but unvarying Pressure—

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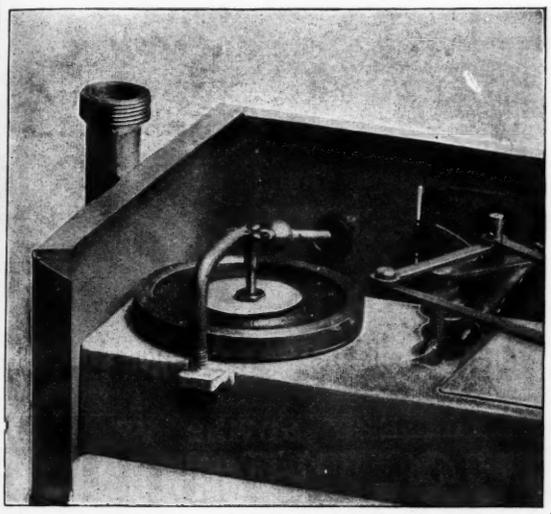

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—MR. IRVIN BUTTERWORTH'S REPORT.

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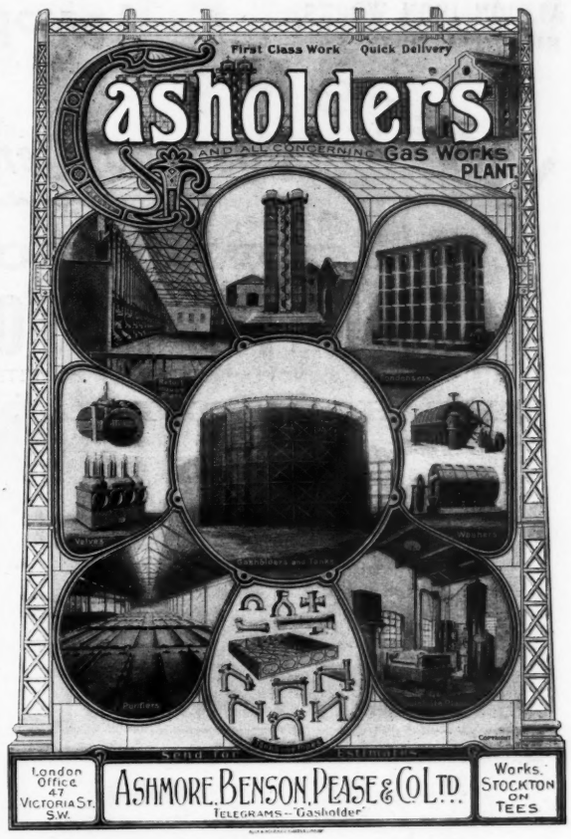

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[See Illustrated Advertisement, June 6, p. 630.]

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(PATENTED)

Fig. 35. 100 c.p.

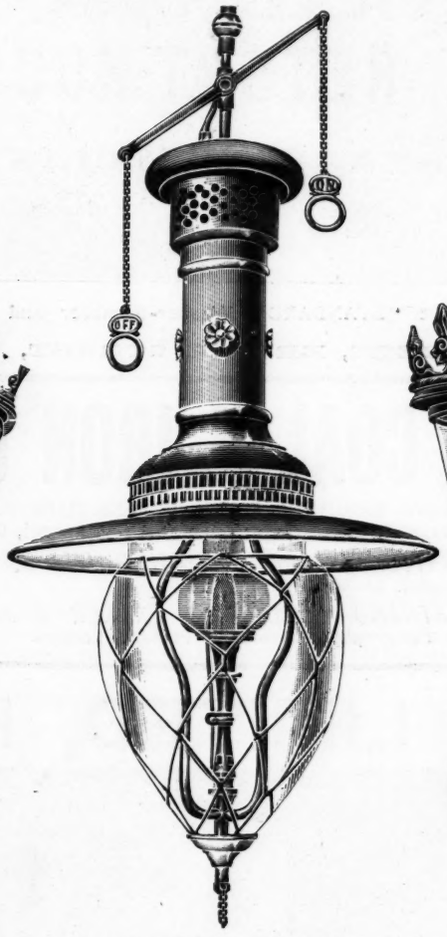

Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
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SPECIALLY LOW PRICES
TO LIGHTING AUTHORITIES.

Thousands of the above Lamps in use and giving satisfaction.

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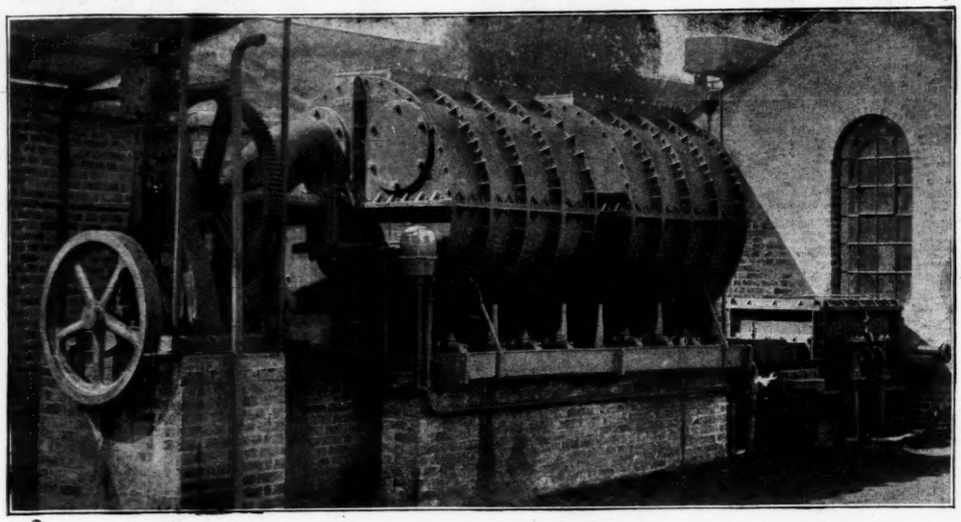

No connection with any persons of similar Names or any Firm making use of such names.

Improved Patent "STANDARD" Washer-Scrubber and Tar-Washer.

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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

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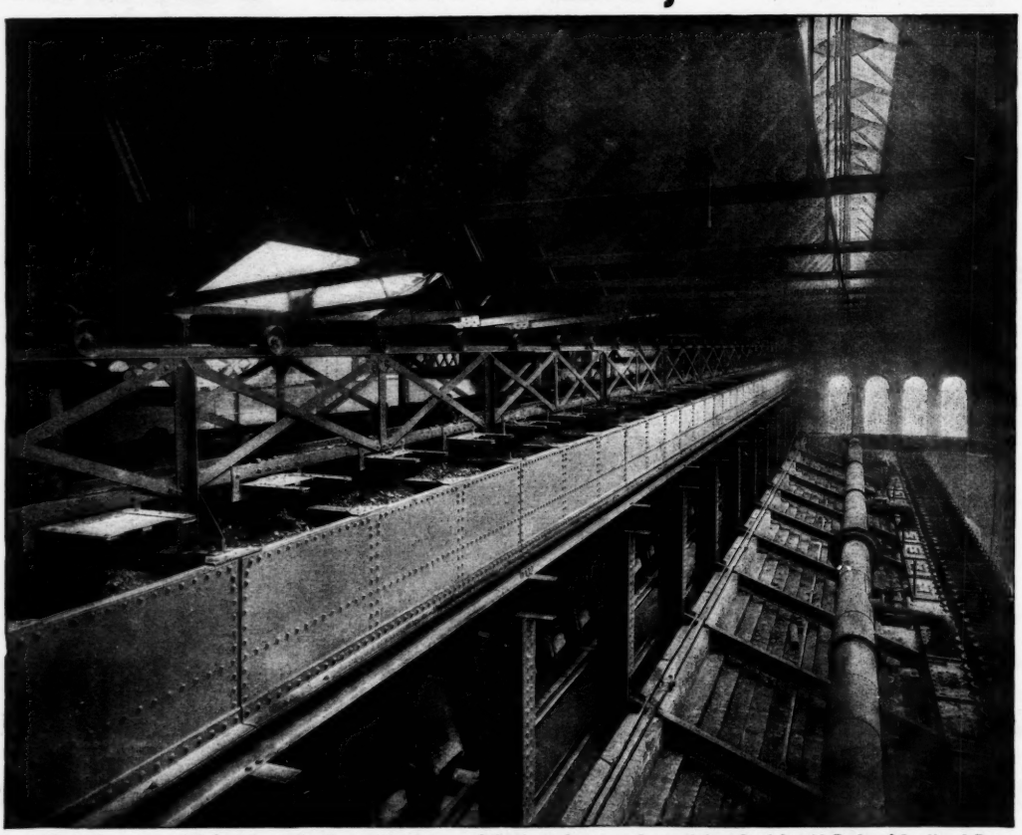
DRAKES LIMITED, HALIFAX.



Push-Plate Conveyor, 160 feet long, dealing with 30 tons of Coal per hour, and supplying Coal for 13 Beds of Inclined Retorts.

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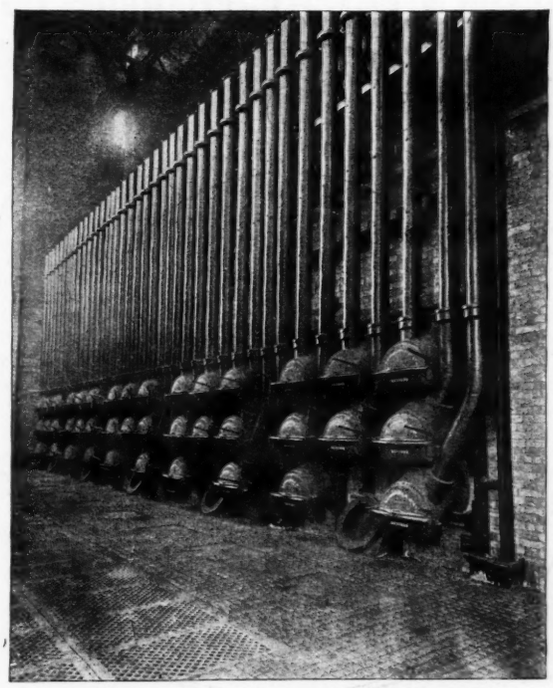

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Oldest Makers of High-Class Exhausting Machinery of all Capacities and for all Purposes.

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Require less Steam and maintain a steadier Gauge than any other type.

OVER 1000 SUPPLIED.

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With Steam or Gas Engine, and all Accessories self-contained on one base plate. From 500 cubic feet to 10,000 cubic feet per hour.

SPECIALLY DESIGNED EXHAUSTER SETS FOR WATER-GAS PLANTS.

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KEEP UP WITH THE TIMES.

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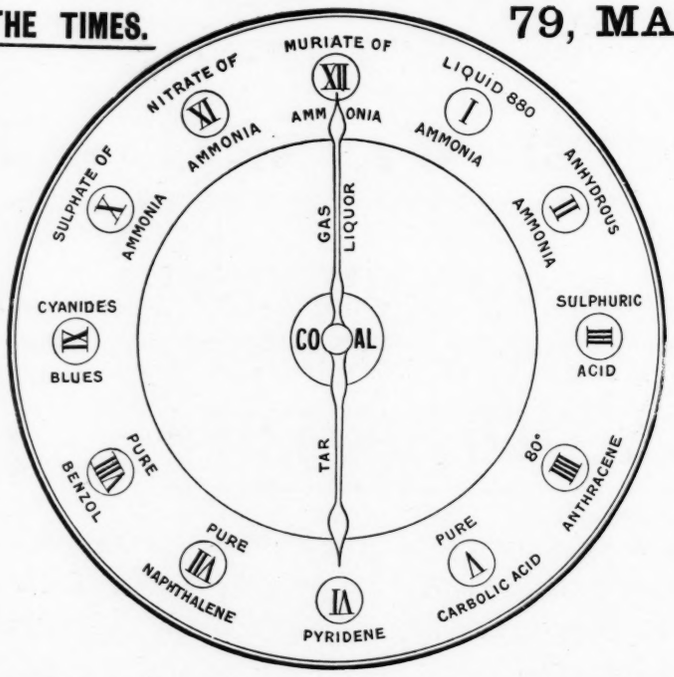

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Can be seen working by appointment.

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&c.

CONVEYORS and ELEVATORS SPECIALLY DESIGNED FOR THE ABOVE PRODUCTS.

Wilton's Patent Neutralizing Apparatus for the Waste Gases from Sulphate of Ammonia Plant.

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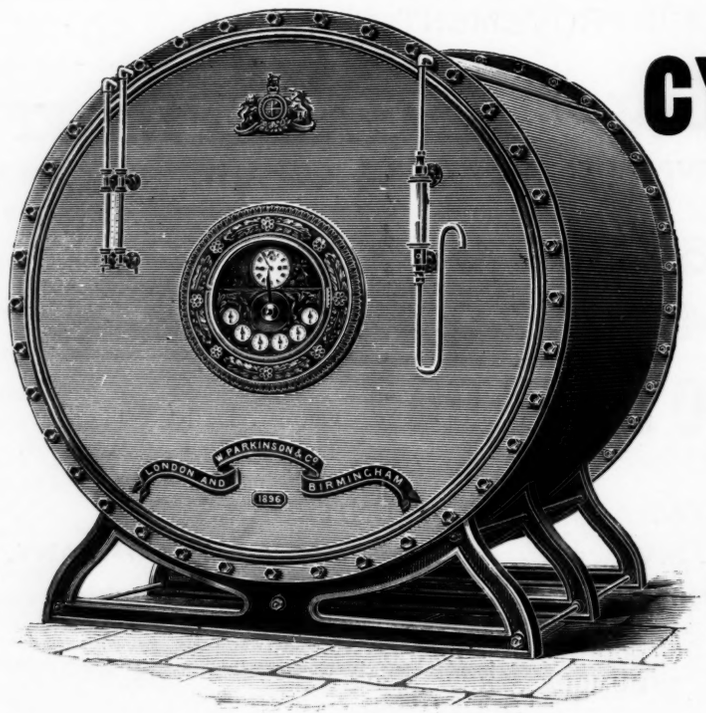

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EDITORIAL NOTES—GAS, &c.

The London County Council and Gas Testing—A Fresh Development.

HOWEVER mistaken and ill-advised has been the action of the London County Council towards the Metropolitan Gas Companies, they have been credited by many of those most closely concerned with sincerity and with a single desire to promote, according to their lights, the interests of the gas consumers. There are few who have suspected them of seeking to make "capital" out of their attempts at gas legislation, or of importing into their parliamentary contests any feeling other than the natural wish that their views as to what is best for the consumers should be allowed to prevail. Nor, it must be admitted, has there hitherto been any indication that they were not prepared to accept loyally the decision of Parliament, however adverse it may have been to the contention put forward on their behalf. Nothing, for example, could be more complete than their acquiescence on the subject of low-grade gas after the contest of 1900, for they actually sought to compel the Gaslight and Coke Company to supply gas of a quality to which they had strenuously objected when proposed by the South Metropolitan Company. Now, however, it seems that *amour propre* counts for a great deal in the counsels of this presumably representative body, and that, in order to extricate themselves from a position of their own choosing, they are ready to sacrifice the best interests of their constituents, the consumers.

It was quite evident that the decision of Lord Rosse's Committee caused great mortification to the officials of the London County Council, as the upholders of the unscientific and unjust 5 cubic feet rate of consumption method of testing all qualities of gas. But, although the withdrawal of the London Gas Bill was in consequence threatened, it was not seriously believed that such an extreme step would be deliberately taken. Now, however, after a fortnight has elapsed, it is currently reported that, either by hook or by crook, the 5 cubic feet rate of consumption method must be upheld, or the Bill is doomed. How and by what means it is to be upheld, seems to the advisers of the Council to be a matter of but secondary importance. It can only be done by the adoption of separate burners for each quality of gas, to which they are said to be willing, but which would be fatal to the establishment of the uniform system of testing so manifestly desired by the Institution of Gas Engineers. But have the London County Council really counted the cost to their constituents, the consumers, of such an expedient? It is to be hoped, for their honour and credit, that they have not.

The proposal for a separate burner for 14-candle gas must, if enacted, take one of two forms: Either a burner must be prescribed by the Act, or else the provisions of the Act of 1868 must be re-enacted, under which it would devolve upon the Gas Referees to prescribe the burner to be used for testing. It would have to be "such as shall be "the most suitable for obtaining from the gas when con- "sumed at the rate of 5 cubic feet an hour the greatest "amount of light, and be practicable for use by the con- "sumer." In either case, the result would inevitably be the adoption of a burner more favourable to the Companies than the No. 1 "London" argand. There are at present two argand burners available for testing 14-candle gas—namely, Mr. Grafton's, and the Wandsworth or Brentford; the latter being already authorized by statute for use in several cases. What is likely to be the result of the substitution of one or other of these burners with a 14-candle illumination, for the method prescribed by the South Metropolitan Act of 1900? An answer to this inquiry is furnished by the report made in 1903 by Messrs. H. E. Jones, Charles Carpenter, and Charles Hunt, which was referred to by Mr. Carpenter in his evidence before the Departmental Committee of the Board of Trade and appears on p. 125 of the "JOURNAL" for July 12 last. It is there stated that gas having an average illuminating power of 14·23 candles, when tested by the South Metropolitan method, becomes of 14·57 candles illuminating power, when tested with the Grafton burner, and 15·40 candles when tested with the Wandsworth burner. Thus the Gas Companies would be actual and substantial gainers in either case by a change of burner, and the consumers would (according to the view of the London County Council and their advisers) be correspondingly losers.

How is it possible to justify such a change, merely for the sake of appearing to conserve the 5 feet rate of consumption method? We say "appearing," because there is really no longer such a thing as a 5 feet rate of consumption method. This was abandoned once and for all when in 1898 the Gas Referees prescribed the 16-candle illumination method. If the London County Council have any real regard for the interests they are supposed to represent, and are in any degree jealous of their own reputation, they will drop all idea of a compromise which can but add bitterness to defeat, and submit to that which has all along been inevitable. It is better to be beaten but not disgraced, than to be both disgraced and soundly beaten.

Forced Regression.

ELSEWHERE we publish the letter which was referred to in last week's "JOURNAL" as having been issued by the Directors of the South Suburban Gas Company to their consumers, announcing an increase in the price of gas by 1d. per 1000 cubic feet from July 1. The circumstances attending this increase are peculiar, and, it may be said, unprecedented. It will be recollected that last year the Company, goaded by their prosecution by the Lewisham Borough Council for nuisances arising out of the use of carburetted water gas and lime for purifying, decided upon abandoning both. In the circular in which the Directors announced this change to the consumers, they pointed out that the gas would, in consequence, have an illuminating power of about 1 candle less than the standard of 15 candles; but they undertook that the saving thus effected in the cost of manufacture should go to the consumers in the shape of a reduction in the price of gas. It was estimated that this saving would not be as much as 1d. per 1000 cubic feet; nevertheless the price was reduced by this amount. At the same time, it was intended to apply to Parliament for powers to legalize the course taken.

The action of the Company appears to have been entirely approved by the consumers, and might have continued to their complete satisfaction but for the intervention of the Lewisham Borough Council, who instituted prosecutions for excess of sulphur and deficiency of illuminating power. On the first occasion, these proceedings resulted in nominal fines being imposed upon the Company. On the second occasion (which was a prosecution for excess of sulphur only), the plea of "unavoidable cause" set up by the Company was not accepted by the Magistrate before whom the case was tried; and, after an adjourned hearing, the Company were mulcted in substantial fines and costs, against which they duly lodged notice of appeal. In the meantime, however, the Bill promoted by the Company providing for the abolition of restrictions as regards sulphur in any other form than sulphuretted hydrogen, and reduction of illuminating power to 13 candles, was speeding its way; and before the appeal could be heard, it had passed through the Committee of the House of Commons without alteration as regards the clauses relating to purification. The appeal was consequently abandoned; and other local authorities, appreciating—as the Lewisham Borough Council had failed to do—the change in the situation as regards sulphur restrictions, turned their blind eyes to their gas examiners' reports. The Company are to be heartily congratulated upon having

at length got rid of what was fast becoming an intolerable burden; for the Bill which is to give them this relief only awaits the Royal Assent to become law.

In respect, however, to the proposed reduction of illuminating power, the Company have been much less fortunate; but the rock upon which they split was not the merits of the proposal, so much as the method of testing to be adopted. As it happens, the Committee of the House of Commons by whom their Bill was considered, had before them also the London Gas Bill, with regard to which they had just previously decided in favour of the recommendation of the Departmental Committee of the Board of Trade to re-enact the 5 cubic feet rate of consumption method, using the No. 1 "London" argand burner. This, if applied to the South Suburban Bill, would have made the 13-candle gas which the Company proposed to supply, appear as of only 10 candles illuminating power; and although the Committee appeared to be willing to meet this objection by describing the gas as of a lower denomination than 13 candles, this was not felt to be satisfactory by the promoters. Sir George Livesey did signal service to the gas industry by withdrawing that part of the South Suburban Bill, rather than submit to the imposition of the 5 cubic feet rate of consumption method. It, however, left the Company in the position of having to continue to supply 15-candle gas, since this can be done by various methods of enrichment, so that, for default of it, "unavoidable cause" cannot be pleaded. Their failure to obtain the necessary powers to enable them to dispense with this enrichment is the more to be regretted since only a few weeks were to elapse before the rejection of the 5 cubic feet rate of consumption method by Lord Rosse's Committee. In the circumstances, the Company have had no alternative but to restore the 1d. per 1000 cubic feet to their price for gas, although, as intimated in the letter, its continuance will depend on the action of the Local Authorities with regard to the extra illuminating power. Subject to their acquiescence, the Company are willing to supply the lower quality at the lower price. But whatever be the issue so far as the Local Authorities are concerned, it is to be hoped that—the ground having been cleared by the decision of Lord Rosse's Committee—the Company will be completely successful in their next appeal to Parliament.

The Superabundance of Institution Papers.

AFTER all the commendatory words (which were fully warranted by the circumstances) that have been uttered and written regarding the recent meeting of the Institution of Gas Engineers, it would be unbecoming to now attempt to attenuate the praise. That, let it at once be emphatically stated, is quite foreign to the intention of what is about to be said. The purpose is improvement in the future, and nothing more. For the second year in succession, the Council of the Institution have found themselves "encumbered" with contributions in the form of papers in excess of what was necessary for filling the allotted time for the consideration of the various subjects brought forward. This in itself is a matter for congratulation; but as it also contains a serious imperfection in the conduct of the annual meetings, an equally serious injustice to the readers of papers, and a bar to the realization of the utmost advantage from the majority of the subjects introduced for an analytical examination by the numerous intellects present (which intellects comprehend a great variety of experience), it is as well to direct attention to the matter with a view to remedying it.

The impossibility must be conceded of exactly gauging the amount of technical matter required at a meeting. Some papers may command a good discussion, given freedom; others, with all possible liberty offered, may not produce anything contributing to the sum of knowledge or, in the least degree, to usefulness. But with the large experience of the Council, and more particularly of their highly estimable Honorary Secretary and Secretary, it ought not to be a matter of difficulty to get into more approximate line with requirements than has been done at the last two meetings. At the recent meeting, Mr. W. R. Herring had the ill-fortune of having his valuable communication taken as read; and no opportunity whatever was allowed for its discussion. The author was unavoidably and unexpectedly detained at home in connection with legal matters; and in their difficulty of having a surplus of technical material, the Council hardly hid their satisfaction that the absence of the author permitted them to give hasty interment in the "Transactions" to this part of their load. Had Mr. Herring been present, there is not the slightest doubt—seeing the pressure the President was bound to apply to the proceedings—that one of the other authors would have had to similarly suffer. The discussion on Mr. W. Doig Gibb's paper was of a very indifferent character, mainly owing to the necessity for marking a respectable amount of progress before the close of one of the sittings. Then many of the essential and constitutive parts of Mr. Brown's paper had to be entirely ignored by him in presenting it, through his inability—again owing to want of enough time—to read the paper in its complete form. The Council, we must give them their due, struggled boldly with their huge pile of technical work; but commonsense asks, Why have such a pile to struggle with?

The continuance of the practice of the Council to obtain a superabundance of papers must inevitably act as a deterrent to would-be contributors, who, when annually appealed to, must be conscious that, after all, their efforts may not be required, and that possibly their labours will be rendered in vain. Moreover, discussions are often of equal value to a contribution itself. But members are naturally reluctant to speak on subjects on which they could convey considerable and valuable information when it is announced that there is little time to get through the programme arranged; and, what is equally deplorable, those who are prone to be a little bit reticent in the matter of public speaking, will fall more and more into the habit of not preparing themselves to contribute to debate when they know almost for a surety that the pressure of time, acting in conjunction with their native reserve, is bound to squeeze them out. One of the principal objects of the annual meetings is thus defeated; and we do not get that gathering in of opinion from diversified sources of experience that should be looked for. The area is limited, the contributions are few, and the readiest speakers appear most frequently throughout the proceedings. There is yet another effect of which we should not lose sight. Now that the London Medal has been instituted, readers of papers will covet the award. When judging the quality of a paper, it may be assumed that the Council also take into consideration its productiveness in the matter of valuable debate. If so, then how can they fairly appraise the value of (say) Mr. Herring's paper which was neither read nor discussed, or that of Mr. Gibb which, through the forcing of its abundant scope into a remnant of a sitting, brought into existence only the shadow of a discussion.

Regarding the matter from all points of view, we think, if the utmost technical benefit is to accrue from the annual conference, that a shortage rather than a surplusage of material for discussion would be preferable; for with a shortage, all would then be sure that there would be no excuse for not giving to each communication that thorough consideration which its acceptance by the Council should signify that it deserves, nor any excuse for anyone who can usefully do so not doing his part in giving breadth to the expressed views. Therefore, in fairness to authors and in the interests of the greatest measure of technical gain, it is to be hoped that the Council in future will only accept those papers which they are fairly confident can be presented in proper manner, and adequately discussed. Better four or five papers completely discussed than seven or eight indifferently treated. There are District Associations who would be only too glad to have turned over to them the papers which the Council prior to the issue of the programme are of opinion could not, within the time at their command at the annual meeting, receive adequate treatment. We cannot at all see why Mr. Herring's paper should not now be read and discussed at all the meetings of the affiliated Associations during the coming half year, and then the author give a written reply to the published criticism in the New Year. If this is not done, or (as an alternative) if the paper is not discussed through the columns of the Technical Press, then (estimating by precedent) it is fairly certain that the subject will not have full justice accorded to it. It is more than probable that, through the "Transactions," it will only be discussed in an altogether deficient and fragmentary manner; and no one will see the views of those who contribute, or the result, for many months yet to come. Publicity of one man's views frequently acts as an incentive in other cases. In the meantime, as the paper was obviously written with the object of creating discussion, we make no apology for calling attention to some of its leading features in an article in another part

of the "JOURNAL," and which article we purpose in an early issue to supplement with one bearing more strictly on "The Manufacturing Costs at Granton."

The Improvement of Consumers' Meters.

IN another part of the "JOURNAL" will be found a full abstract of a paper read before the American Gaslight Association, at their last annual meeting, by Mr. B. H. Spangenberg, the Superintendent of Meters at the Philadelphia Gas-Works. The tests and the experimental meters described had their origin in a desire to present, in a convincing manner, evidence of the non-uniformity in dimensions and capacities of meters of the same nominal sizes; and to show, by the meters themselves, how certain inexpensive and advantageous changes in construction would, without altering the external dimensions, greatly increase the capacities. The results aimed at are very much to be desired. Operating costs are appreciably lessened if, when changing (say) a 5-light meter, the new one, though from a different maker, fits exactly the old connections. Through the hearty co-operation of the meter-makers in effecting several years ago the standardization of meter-unions, this interchangeability of meters and connections of the same sizes has been possible to gas companies willing to standardize all non-standard meter-unions, as the meters were brought in. How widely, however, the various makes differ in capacity, and how waste of capital investment is thus caused, is well shown in the paper. The author having demonstrated the existence of the evil, develops his remedy, and it is the latter which probably makes the paper mark an epoch in the meter business. By tests of meters actually made, it is believed that a gas company may, in future, reduce the sizes of meters installed as shown on the table at the end of the paper. When it is stated that the cost of the new sizes will not be appreciably, if any, greater than that of the present meter of the same nominal size, it is at once apparent what a great saving will be possible if the author's conclusions are borne out in practice. In the discussion that followed the reading of the paper, the meter manufacturers took the ground that the present design was adopted to prevent overworking of the diaphragm, and that the increased speed necessary to obtain the new capacity must result in shortening the life of the meter, and causing a larger average error while in use, except perhaps under the condition of absolutely clean gas, having no deposit to interfere with the diaphragms and valves. In answer to this, it was stated that rarely, if ever, is the meter called upon for the capacity for which it is set, and that on occasions it could run at an even higher speed than contemplated by the new design. To British and Continental readers this matter is possibly of interest only as something which should be watched for future developments. Of course, if American experience proves favourable, other meter makers would naturally have to enlarge the capacities of their meters on somewhat the same lines. However, to any company purchasing many meters (10-light or upwards in size) each year, the saving effected by the new design would more than pay for some effort to prove the claims of the paper as soon as possible.

A Progressive Undertaking.

SIR JOSEPH BELLAMY—who is to be congratulated on his new appointment as Managing Director of the Plymouth and Stonehouse Gas Company—had a very pleasant story to tell the shareholders at the annual meeting of the Company on Thursday last. With the single exception that the increase of consumption was at a lower rate than in some recent years, the past twelve months has been for the Company a period of abounding prosperity. It was remarkable for the two important facts in the Company's history, that the cost of producing the gas touched the lowest point, while the profit reached the highest amount yet recorded. As the Chairman remarked twelve months ago, the business of the Plymouth Gas Company is fixed upon a very solid foundation. Like other undertakings, it may be affected temporarily by weather conditions or by the state of trade; but, considered on the whole, it undoubtedly enjoys the confidence of its customers, and it does a continually increasing business because it lays itself out to meet the requirements of the public. It is all in its favour that it is able to supply cheap gas in a district where coal is not cheap. Largely because of this, it can look forward to a time (probably not distant) when the day consumption will be equal to the night demand. This result will no doubt be contributed to by the notable step which has been taken in the reduction of the price of gas for power purposes. As the Company are working under sliding-scale conditions and have hitherto supplied gas at one price for all purposes, this departure is one of considerable importance. If it is a prelude to the supply of eighteenpenny gas for all purposes, which was announced some time ago as the aim of the Company, the consumers generally will regard it with satisfaction. In the meantime it is considered by the Directors as a necessary measure to meet the competition of the municipal electricity and of producer gas supplies. Still it is an experiment; and the outcome of it will be watched with interest by other companies.

Another direction in which change is foreshadowed is that of the stoves and fittings department. On the expiration next month of the present agreement with Messrs. Richmond and Co., the Gas Company will take over this business of hiring-out and selling stoves and fittings. In connection with this change, there is to be a reduction in the charges for the hire of cookers, which are to be let out on such easy terms that, as the Chairman puts it, no householder will care to be without one. Like the supply of cheaper gas for power, this will no doubt have the effect of stimulating the day consumption. As this is what is aimed at, the policy of supplying stoves free or at a merely nominal rental has much to justify it. At the same time, it is open to question whether the interests of the Company would not be better served by an all-round reduction in the price of gas. Little concessions in various directions may lead to small increases in the use of gas by those directly benefited. A reduction of the price affecting all the consumers alike would, on the other hand, probably strengthen the position of the Company against all competitors, and at the same time give to the shareholders some of the fruit of the great expansion of business on which the Company have so much right to pride themselves. The difficulty with regard to such concessions as are now announced is that, when once made, they cannot easily be withdrawn. If they contribute to the prosperity of the Company, there will naturally be no temptation to withdraw them; but the shareholders cannot receive an increased dividend until the price of gas is reduced.

Education Authorities as Passive Resisters.

The thanks of gas suppliers in general are due to Mr. T. H. Hazell, the Secretary of the Newport (Mon.) Gas Company, for the trouble he has taken with regard to a matter which was referred to in the "JOURNAL" about two months ago under the above heading. The results of Mr. Hazell's efforts have been to remove a difficulty that had arisen in connection with his Company and others throughout the country; and though the point was perhaps not a vital one, it is very satisfactory to find that it has been cleared up in the manner set forth in another column of to-day's issue. Consumers who object to any charge whatever being made for meter-rent, are familiar to all; but this was not the case in the present instance. Here it was merely a question of who should be held responsible for the payment. At Newport, the trouble arose over the County Council, in paying for the gas supplied to a non-provided school, striking out the item of meter-rent, which the Board of Education had decided was a liability of the school managers. In view of the provisions of sections 13 and 18 of the Gas-Works Clauses Act, 1871, relating to the payment of meter-rent, this contention did not satisfy Mr. Hazell, who therefore sought an interview, and discussed the matter with the Education Board's standing Counsel. The outcome of this has been the issue of the circular we reproduce, the effect of which is to alter the decision previously come to, and to advise local Education Authorities that they should pay the meter-rents as part of the gas or water consumed. The attitude originally taken up by the Board in relation to this subject, and the considerations which have led them to alter their views, are set forth in the circular, and need not be stated here. Our object in calling attention to the matter in this part of the "JOURNAL" is to make certain that the Board's decision shall be noted by all whom it may concern. Apart from the practical inconvenience that gas

suppliers may be saved by the concession Mr. Hazell has secured from headquarters, the removal of possible causes of dispute is always to be welcomed. In spite of anything that fault-finders may say to the contrary, gas companies are quite as anxious as other commercial people to carry on their business without suspicion of friction; and in at any rate one direction, the circular referred to will assist them in doing this.

Enfranchisement or Loss of Ratepayers.

Industry has made our country what it is; and if we look round, with an eye to the special consideration of the subject, it is found that all our great and prosperous cities and towns have been created and nurtured by private enterprise. Nevertheless, the vast industrial enterprises that have done all this, and that contribute in many places the greater part of the funds spent in local administration, have, under an anomalous condition of things, absolutely no voice or power in the government of local affairs. In view of their position as bearers of a heavy share of the costs of local government, the matter of seeing that their money is spent to the best advantage is of vital importance to them; and many authorities will, with present growing assessments and rates, be made to learn before long that the question is also one of grave concern to them. Industrial establishments that are not bound to a particular district for carrying on their operations will look about them for suitable districts for their works, where the "burden of the rates" does not hang so heavily. Gas companies, of course, are immovable, and cannot escape, however shameless in their thriftlessness the local authority may be. But others will do so. Mr. J. G. Broadbank is the President of the West Ham Municipal Alliance; and, in an address the other day, he was referring to his own experience in the case of the Albert and Victoria Docks. More than 25 per cent. of the profits of the Company goes for local purposes; and yet they repair their own roads, have their own sewerage, lighting, baths, and library. Such is the tremendous burden of the rates that, though the Company have incurred the expense of an Act of Parliament to empower them to make a new dock, there is little doubt, Mr. Broadbank says, that they will go to Tilbury, where the rating authority are more reasonable and the rates are rather decreasing than increasing. In another part of the address, it is seen that his Company pay £30,000 a year in rates, and yet have no vote. He is of opinion that the only proper basis of voting for local purposes is one vote for every pound of annual value. If enfranchisement for local purposes does not quickly come, there are many limited liability companies —who have helped to create districts, who contribute largely to the district funds, and who can offer men experienced in the conduct of business for the work of local government—who will (as Mr. Broadbank suggests) be withdrawing their support from cities and towns which can ill-afford to lose them. There are districts that will become highly prosperous in the future merely through the lowness of their rates.

Consolidation of Gas Associations in America.

Amalgamation and affiliation have done their work of bringing on to a common base the Gas Associations of England and Ireland; but for the time being Scotland has to be left out. The success that has attended this coalescence without affecting the individuality of any one of the District Associations, arouses interest in the discussion of the question of the consolidation of the Gas Associations of America. Opinion there appears to be much divided on the subject, and apparently because no concrete scheme has been formulated, and put forward for digestion and then final decision. But we must not on this side, it is clear, claim too much in this matter of the consolidation of professional interests; for there were men in America in 1887, and for several years previous to that, who were endeavouring to form an Association or Board, "representing all the Gas Associations and all the Gas Companies in the country." In the year named, Mr. Frederick Egner was reading a paper before the Western Association on "An American Gas Institute." Some years passed before the matter was again broached in any noticeable form; and then at the Convention of Gas Associations at St. Louis in June, 1904, a Committee was appointed for the express purpose of formulating a scheme for "a single Gas Association composed of the men engaged in the gas industry in North America." But nothing of a tangible nature, so far as we have seen, has yet emanated from the Committee. In his Presidential Address to the Western (U.S.A.) Gas Association, Mr. O. O. Thwing dealt with the matter; and it is manifest that he is not particularly struck with the idea that consolidation would yield much advantage. He is not alone. Against it too there is the influence of a strong sentimental feeling on the point of injury being done to the American Gaslight Association and the existing organizations which cover considerable territories in the States, and which have contributed good and useful work to the industry. There is no necessity whatever in a scheme of consolidation to do anything other than make the American Association the centre of the consolidation; not a single Association of the several in existence need lose its identity. But a scheme of consolidation could bring every one of the Associations into unity with the American Association in active work and purpose; could centralize and so save money, time, and labour in, and an unnecessary repetition of, research work; and could each send its delegates to the Council of the National organization to represent the views, interests, and area of the Association appointing them. Mr. Thwing is one of those who, while he cannot discern any particularly useful purpose that is to be gained by consolidation, is obviously open to conviction; for he can see no reason why a project should not be put into shape, and then be submitted to the whole of the Associations for criticism, amendment, and, if thought expedient, for final co-operation. This is decidedly the best plan, and would be the most effectual means of gauging the actual feeling on the subject. No sentiment need be imported into the matter; for it resolves itself completely into the one question of whether the gas organizations of America in their present distinct existence are attaining the utmost good for themselves and the industry generally, in the most economical manner. If not, is that condition to be attained by the District Associations welding themselves, in the manner indicated, to the national body? We believe it is.

Corporation Gas Undertakings.

This is the time of the year when it is the custom of those committees who are privileged to have control of corporation undertakings to render an account of their stewardship. As regards the most profitable branch of municipal trading—gas supply—this account is usually a satisfactory one from the ratepayers' point of view. Generally speaking, the question is not whether the results of the year's operations are good, but merely how good they are. In this respect, therefore, at any rate the position of the Chairmen of Gas Committees is a pleasant one. They have not, as unfortunately is so often the case with others, to draw upon future prospects for encouragement; the present is good enough for them. They have at times their anxieties, of course (no commercial operations can be entirely free from them); but these chiefly have reference to the price of coal and the returns from residual products, and are not such as in any sense affect the soundness of the business which they administer. Competition is keen, and threatens to become still keener; but gas shows itself able to hold its own with the most formidable of its rivals. The results that are so far to hand bode well for the future of the industry, though in too many cases there are to be found traces of the period of trade depression through which the country generally has passed during the last twelve months. Another factor which has, of course, of recent times tended to restrict output is the growing adoption of incandescent gas-burners. In neither case, however, is there the least need for worry, as the influences referred to are but passing ones. The first is one that while it lasts must more or less affect every commercial concern; while the second cannot, as has many times already been remarked in these pages, fail to greatly benefit gas undertakings in the long run. While the change from flat-flame burners to the incandescent system is going on, the consumption must suffer to an extent; but once the point of saturation has been reached—as in time it must be—the temporary loss in this respect will no doubt speedily be made good, and the output will go ahead again on an even more secure basis than before. Residuals make rather a bad showing on the present occasion.

Some Results.

Both the factors mentioned have influenced consumption at West Bromwich, where the total sales of gas (including public lighting) show a falling off of nearly 4½ per cent. At Bolton also there is a reduction of 5½ per cent. in the quantity of gas sold

—due to precisely the same causes. Nevertheless, the balance in this instance is only £6700 less than last year's record figures. Bradford has to announce a deficit of £1820, but only because the consumers have benefited to the extent of £13,000 by a reduction of 2d. per 1000 cubic feet in the price of gas, which came into operation on July 1, and affected five-sixths of the sales of gas for the financial year. Here the Chairman of the Gas Committee has had to confess that the sales of gas have been disappointing—owing chiefly, of course, to the bad state of trade in the district—while the fall in the value of residuals seriously affected the results. Turning to Lancaster, it is to be noted that the quantity of gas sold during the last twelve months shows an increase of 2½ per cent.; and the decrease experienced in the receipts was owing to a reduction of 3d. per 1000 cubic feet in the price of gas. This falling off in receipts it is safe to predict will rapidly be made good by the impetus which the cheaper supply of gas will give to the demand. The same may be said of Lincoln, where the net profit of £4985 was £1370 less than in the previous year, but a reduction of 2d. per 1000 cubic feet took £1600 from the income; and also of Loughborough, where a similar reduction in price, and a falling off in the value of residuals, has led to a slightly decreased profit. Middleton is to be congratulated upon the fact that a loss of £570 the previous year has been turned into a net profit of £789 on the present occasion; the gas sold showing an encouraging improvement. In this case we see once more what an aid to increased consumption the prepayment meter has been; practically one-third of the consumers now taking their gas in this way, while the ordinary meters do not show any great disposition to decrease in number. Very satisfactory profits are reported from Wigan, though they are not so great as the previous year, in consequence of the prices of residuals not being so high and more having had to be paid in rates. St. Helens shows a profit of £11,202; and the consumers are to be congratulated upon an all-round reduction in price; the charge to prepayment consumers in the borough being brought down to 1d. for 35 cubic feet. The Bury Gas Committee have had to face a heavy drop in the receipts from residuals; but in spite of this, and the fact that a number of retorts were rebuilt out of revenue, there is a handsome profit shown. In this instance, however, it appears from the discussion on the matter which took place in the Town Council that the consumers are not quite so fortunate as those in other places that have been named, inasmuch as although the initial price of gas is to remain unaltered, the allowance per 1000 cubic feet is to be 1d. less. At Cleckheaton, the gross profit was slightly better than for the previous year; tar and ammoniacal liquor having realized a little more. The results at Widnes—where nearly every householder is a consumer—cannot but be regarded as satisfactory; the net profit, with gas at 1s. 4d. per 1000 cubic feet for private consumption and 1s. for power purposes, amounting to £6135. Burslem has to record a decreased output of slightly under 2 per cent.; but in spite of this, there is a net profit of £3536, as compared with £127 for the preceding twelve months. In his first annual report to the Southport Gas Committee, Mr. J. Bond is able to announce a satisfactory increase of nearly 3 per cent. in the amount of gas sold, in spite of the bright summer and comparatively mild winter that were experienced.

And Criticism.

This greatly improved result—due largely, be it noted, to the efforts of the Engineer (Mr. Henry Peaty), whereby the make per ton was increased from 10,261 to 10,964 feet—should effectually disarm the criticism to which the Burslem Gas Committee have lately been subjected, and of which the Chairman very naturally complains. A rise in the net profit from £127 to £3536, along with a decrease of about 2 per cent. in the output of gas, is an achievement of which those responsible for the management of the undertaking have just cause to feel proud; and we should have liked to see the councillors generally show their appreciation of what has been accomplished in a more cordial manner than they appear to have done from the published reports of the meeting at which the balance-sheet was considered. Possibly, however, disappointment at the fact that no part of the profit is to be handed over "in relief of the rates" was responsible for the seeming lack of enthusiasm. Indeed, this was evidently the case with at any rate one member of the Council, who remarked that the gas undertaking was the only profit-earning concern the Corporation possessed, and they ought therefore to get their full profit, to the last farthing, out of it. The Chairman of the Committee, too, admitted that he was aware of the fact that a certain class of ratepayers—those, he somewhat unkindly added, "who were fond of writing to the papers"—would have much liked to see £1000 handed over to the rates, even if the Committee had to go to the bank to borrow the money the next day. Perhaps he might also have added that besides being fond of writing to the papers the particular persons referred to were not gas consumers; for otherwise it is difficult to understand their disagreement with the policy of the Committee. There is an overdraft at the bank to be cleared off, as well as an extensive depreciation to be met in the value of the Consols in which the sinking fund is invested; and besides this the Committee are rightly desirous of accumulating a reasonable trading balance. Burslem is to be congratulated upon having as Chairman of its Gas Committee a man who is strong enough, in the face of his critics, to maintain that the first duty is to place the concern on a sound commercial basis, and to say that as long as he is connected with the undertaking he will advocate this policy, whether it is popular or not. In addition to the ratepayers, as such, not having paid a single penny towards the cost of the works, they have during the past quarter of a century received more than £50,000 out of the profits; and this being so, it is hard to understand what just cause of complaint they can have. On the other hand, the gas consumers have every right to expect that their money shall first of all be used for improving the position of the valuable property which is being paid for by them, and that the people who have done nothing whatever towards the purchasing of the works shall stand aside at any rate while this is being done.

British Association of Water-Works Engineers.

Final arrangements have now been made for the annual meeting of the Association, which is to be held at Hastings on the 29th inst. and two following days. The President is Mr. Philip H. Palmer, the Corporation Water Engineer; and the Mayor (Mr. Charles Eaton) and the Corporation are doing their part in ensuring a successful meeting. The Mayor will receive the members at the opening sitting in the Council Chamber (which has been placed at the disposal of the members for holding the meetings), and will subsequently entertain them and their friends at luncheon at the Albany Hotel. From the preliminary notice which the Secretary (Mr. Percy Griffith) has circulated, it is seen that the papers to be presented on this occasion are not conspicuous for their quantity; but their titles suggest that they will make a good showing in respect of quality. There is to be one by Mr. E. Devonshire on "Steel and Concrete Construction at the Antwerp Water-Works;" a second by Mr. John H. Crowther, describing the "Extensions at the Wallasey Water-Works;" and a third by Mr. G. O. H. Klopp, treating of "The Relationship between Capital, Working Expenses, Revenue, &c., of Water Undertakings." There is also to be an evening lecture by Mr. H. F. Cheshire, F.I.C., B.Sc., on "Oxidation and Corrosion." A drive on Friday afternoon will include within its range an inspection of the Filsham pumping-station, and the West Hill, Newgate, and Fairlight reservoirs; and a morning drive on Saturday will enable the members to make an inspection of the new pumping-station in the Brede Valley. The annual dinner is to be on Friday evening.

The Analysis of Mine Gases.

The late Sir C. Le Neve Foster, F.R.S., and Dr. J. S. Haldane, F.R.S., are the joint authors of a recently published book on "The Investigation of Mine Air." In the first section is a translation of an introductory treatise on mine-air analysis by Professor O. Brunck, of the Freiberg School of Mines; the methods of analysis for mine gases described by him being simple, and in no respect less accurate than the most delicate methods of exact gas analysis. This is the expression of opinion of a reviewer of the book, signing himself "B.H.B.," in "Nature." Regarding the third section, which deals with Dr. Haldane's work in this direction, he says: The methods of determining oxygen, carbonic anhydride, nitrogen, and fire-damp described by Dr. Haldane well fulfil the practical requirements of being very accurate and rapid. His method of obtaining and transporting samples of mine air in 2 oz. stoppered bottles is trustworthy and much more convenient than Poussigue's method of using a 1½-litre bottle, or Winkler's method of using a 10-litre sheet-zinc vessel recommended by Brunck. One cannot help thinking that in the latter case prolonged storage in a zinc vessel would have an effect on the composition of the gas. In Dr. Haldane's dry bottles, no sensible alteration of the contained sample occurs within a fortnight or more. His method of gas analysis is similar to that originally described by him in the "Journal of Physiology" in 1898; and he now describes for the first time a portable apparatus, enclosed in a wooden case measuring 7 in. by 12 in. by 2½ inches, and weighing 5½ lbs., by means of which accurate determinations may be made, on the spot underground, of various impurities in the air.

RECORDS OF MANUFACTURING COSTS.

THE paper which Mr. W. R. Herring went to some considerable trouble to prepare for the recent meeting of the Institution was neither read nor discussed, partly because the author was compulsorily detained in Edinburgh in connection with litigation in which the Gas Commissioners were very intimately concerned, but more especially because time was of such importance at the meeting that technical discussion on certain of the papers could not be allowed to thoroughly mature, and debate on this one had to be completely suppressed. The paper is a double-sided one; but only one of the sides is revealed in the title, although the other is dependent upon it. In this article, we shall only refer to the depending side; and the lessons of the publication of the manufacturing costs at Granton will form the material for a second article in a future issue.

Mr. Herring again reverts to a subject originally raised by ourselves a few years ago, as to the classification of the titles under which the records of manufacturing costs of the industry are kept. And here it may be incidentally remarked that we are sorry the author's former proposal for the construction of a proper model upon which to classify manufacturing costs for comparison has been burked under cover of the circumstances attending the reorganization of the divided bodies of the profession into a corporate whole. Something may even now be done, if engineers will only follow up by discussion this fresh case with which Mr. Herring presents us in his paper, and eventually urge the Council of the Institution to consider, report upon, and issue under their authority a model to which engineers can conform for comparison purposes. It is quite probable that there are many members of the profession associated with the older types of works who have not yet realized the necessity for some considerable elaboration of the methods of recording the manufacturing costs of a modern works. For such as these, we opine the paper can have but an academic interest. But there are a vastly increasing number to whom the subject must appeal as being of vital interest. The discussions at technical meetings demonstrate beyond doubt the necessity for the introduction of a system of comparative costing and statistical analysis and research, whereby alone can be properly appreciated the economic merits of the many varying types of plant, and the methods of manipulating them at present available to the gas manufacturer, but which for want of such systematic record are still matters of dispute.

Next to the inclined retort controversy, or perhaps even in volume occupying the premier place, is the controversy that was waged as to the relative merits of the generator and regenerative systems of firing. In the paper, Mr. Herring puts a finger on the spot that led to a great deal of this controversy always ending unprofitably, both for the industry and those who took part in it —viz., the yield of coke from a ton of coal. It is admissible that various classes of coal yield various classes of coke, and that even methods of carbonization may to some extent alter the weight of the resulting residue The common practice of carbonization is, however, sufficiently uniform to set aside the varying weight yielded as a consequence of the varying temperatures employed in carbonization. We have therefore only left the varying characteristics of the coal itself; and as the supply of coal to a given works—take, for instance, the coal supplied to the London Gas-Works– comes from approximately the same geographical area year by year, it is by no means a difficult matter to ascertain for an absolute certainty the yield of coke that should be secured per ton of coal carbonized. Even if a works is using many different classes of coal, it is an easy matter to ascertain, by quite a simple experiment (which need not be elaborated here), the weight of coke yielded from the coal so used, and the figure thus found can be multiplied into the number of tons of that particular class of coal used during any given period.

Now for the facts as brought to light by Mr. Herring. He states on his own authority, backed by the experiments of the late Mr. Frank Livesey, that 15 cwt. of coke are yielded per ton of ordinary Newcastle coal. If we are not mistaken, the majority of works estimate a production of only 12 cwt. per ton of coal. Why such an estimate, we may ask, when the fact is so easily ascertainable? As is justly pointed out by the author, the Croydon Gas-Works take credit for selling 13½ cwt. of coke per ton of coal carbonized; whereas neighbouring works only manage to sell 10¾ cwt. Carrying the analysis still further, Croydon works with a fuel account of 7½ lbs. per 100 lbs. of coal carbonized; whereas the remainder of the London Companies require nearly three times this amount. Surely it is time that steps were taken to determine once and for all this simple problem. We venture to suggest that, if the Council of the Institution were to determine this one point alone, by asking for a return from every gas engineer in the country—setting forth the principal coal he uses, and the quantity of coke obtained from charging, carefully by hand, 2 tons (say) of such coal into a given number of retorts, the entire contents after carbonization being drawn from the retorts and weighed after careful quenching—they would gain the approbation of every member of the profession whose desire is to see its records founded on fact where such facts can be determined.

Well, now, it will be seen by those who read his paper that Mr. Herring pleads for a more detailed definition of the titles forming Schedule B of the Gas-Works Clauses Act of 1871, on the grounds that, as at present framed, they do not permit of a sufficiently clear method of stating the actual costs of manipulating (say) an inclined retort carbonizing plant and a machine-charged carbonizing plant, to plainly demonstrate the distinctive difference between the two types. He does not confine himself to this alone, but subdivides the carbonizing plant as well as every other section of the works, so as to ascertain, for instance, whether coke-conveyers are cheaper than wheelbarrows, and overhead railways cheaper than coal elevators and conveyors of other types. Where, under the present system of keeping accounts, can comparative information of this kind be obtained without making special application for it to the engineer of any particular works; and in some works the items are so confused with others of totally different character that the engineers would have considerable difficulty in themselves furnishing even approximate figures. Yet how important they are in the interests of a universal enjoyment of that which gives the ultimate economy.

In the closing lines of his address at the recent meeting of the Institution, the President (Mr. D. Irving) gave utterance to this striking statement:

> Therefore the conclusion of the whole inquiry appears to be irresistibly what has been stated, that the fundamental factors of the gas industry of the United Kingdom have not materially changed during the last twenty years. One internal influence has set off another, so that the industrial economics of the industry remain *in statu quo*. We seem to have done a great deal of running, in order to keep our standing; and some will have considerable difficulty in accepting the conclusion.

The conclusion is perhaps fair and just from the figures and data upon which it is founded; but are the figures and data upon which it is founded a correct representation of what has been accomplished in the gas industry during the past fifteen or twenty years? Averaging is sometimes a dangerous expedient, and only blinds the vision to actual facts.

If we rightly comprehend what Mr. Herring desires, it is a system whereby the individual merits of different works will be shown on the face of their statistical records, and not lost in a multitude of averages which only tend to reduce the known efficiency of the best works, and give an undue credit to those who still follow the old and obsolete methods. Such men are very apt to be satisfied to approach the average, but such men do little real good in the world. Take, for example, the London Companies with their several works. The Provincial gas engineer cannot determine whether the Beckton works or the Nine Elms works is the better of the two, or the East Greenwich works better than the Bankside works, for the simple reason that their figures are all averaged, and we are unable to appreciate what must inevitably exist, or to admire the economical working of (say) the East Greenwich works of the South Metropolitan Company. The merits of these works either in regard to their carbonizing methods or their general plan and design are not discoverable by the outer world as a consequence of the present method of recording the manufacturing costs for publication. Mr. Irving will follow this reasoning by applying it to his various stations, and to the dissimilar systems of realizing similar ends which exist in them.

The law of averages is enervating, and in no way acts as an impelling force to those with energy and ambition to do something more than has been accomplished in the past. It must, therefore, be agreed that it is of vital importance to the gas industry to set to work to determine a basis upon which the relative merits, not only of different types of plant but of different types of works, shall be easily discoverable, so that the industry, as a whole, may profit by the energy of the few, and thus advance the economic status of the whole.

As already stated, the salient points bearing more definitely on the title of Mr. Herring's paper are reserved for a second article.

The Junior Institution of Engineers.

The summer meeting of the Junior Institution of Engineers is this year to be of a special character in celebration of the Society's "coming of age;" and it is to be held earlier than usual, so as to include "Foundation Day" (June 30). It commences on Monday, June 26, on the morning of which day the Lord Mayor and the Sheriffs will receive the members in the Council Chamber of the Guildhall of the City. The proceedings will include the reception of representatives of kindred Associations, the presentation of a historical note by Mr. W. J. Tennant (Past-Chairman), a short Address by the President (Mr. W. H. Lindley, of Frankfort-on-Maine), and votes of thanks, after which an adjournment will be made for luncheon. In the afternoon, there will be a special visit of inspection to St. Paul's Cathedral; and subsequently the members will be received by the Lord Mayor and Lady Mayoress at the Mansion House. On Tuesday, both the morning and afternoon will be devoted to visiting Woolwich Arsenal; and in the evening there will be a reception by Mr. and Mrs. Lindley and Mr. and Mrs. Samuel Cutler, jun., at the Royal United Service Institution. For Wednesday, various visits have been arranged. On the following day there is to be an excursion to Chatham by the *Clacton Belle*, including a visit to the dockyard. Friday morning will again be devoted to works' visits; and the afternoon is to be spent at Earl's Court—the day concluding with a dinner.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 912.)

A FURTHER disappointment was in store for the Stock Exchange last week. It had been fondly hoped that, with peace prospects so well initiated, there would be a display of considerable buoyancy on the reopening after the Whitsuntide holiday. So business on Tuesday began with a flourish; but somehow it would not last. The public seemed to think it better to wait a bit; and then there supervened disagreeable apprehensions regarding the Morocco difficulty. The consequence was that most of the rise slipped back again, and things relapsed into a very quiet and rather dull humour, which persisted until the close. The settlement demanded the chief attention; and so far it does not seem to have produced any very formidable difficulties. In the Money Market, there was the usual increased demand for the Stock Exchange. But rates were not stiff; and the close was easy. Business in the Gas Market was decidedly on a restricted scale, and, setting aside the dealings in the largest Company, the aggregate of business in all the rest put together amounts only to a moderate array. There were few changes in value, and they were irregular; so there was no pronounced tendency either way. In Gaslight and Coke issues, the ordinary was fairly active. The prices at which transactions were done were much the same as during the week before—ranging from 99½ to 100½; but the quotation was put down half-a-point before the close. Of the secured issues, the maximum was done at 92; the preference was active at from 109½ to 110½; and the debenture changed hands at 91¾ *cum div.* and 89½ *ex div.* In South Metropolitan, there was only one deal; the price being 129½. In Commercials, there were a couple of bargains marked in the 4 per cent. at 116; but the 3½ per cent. and the debenture were not touched. In the Suburban and Provincial group, there was a moderate amount doing, having regard to their general inactivity; but no change in prices was effected. Brentford old was marked at 251 and 251½, and British at 40¾. South Suburban ordinary changed hands at 122, ditto debenture at 133, and West Ham debenture at 104. On the local Exchange, Newcastle ordinary receded fractionally; but the debenture had a substantial advance. In the Continental Companies, there was a little business done in Imperial. The opening price was 214½; but it soon slipped down to 211½, and the quotation receded a point. European fully-paid was done once at 22½. Union was not touched. Among the undertakings in the remoter world, Bombay new was done several times at 5¼. Primitiva ordinary had a fractional relapse; business being done at from 5⅞ down to 5⅝. The preference marked 5⅛; and ditto debenture, 96¾. River Plate was more active, with several transactions marked; and the prices ranged from 11¾ to 12⅛. The debenture was done once at 98½.

For closing prices see Stock and Share List on page 912.

ELECTRIC LIGHTING MEMORANDA.

Municipal Disappointments—The Motor Loads of London Electricity Undertakings—On Municipal Leakages—An Illustration from Croydon—Trapping New Consumers.

THIS is the season for the publication of the annual financial returns of municipal electricity departments; and several of those that have so far come under notice must, we venture to think, be exceedingly disappointing to all who have the direction of these concerns. There are, of course, some undertakings that have done well; but many of those which have not made progress of which they can boast, are not altogether unrepresentative ones. To trade depression is generally ascribed retrogression or slow progress. But in most instances there has not been a set-back in the number of units sold, so that the cause of financial disappointment in those cases must be looked for in another direction. At Sheffield, advance has not been so rapid as was predicted; and on a turnover from all sources of £59,396, the accounts show a loss of £650, after meeting all charges. The department, however, has fortunately an accumulated surplus from past working of £21,002, which the £650 will assist in reducing. The General Manager says he does not look forward to "any considerable surplus" in the current year; and he "respectfully" suggests that, in order to hasten financial success, it is important that the lighting of every municipally controlled building and the principal thoroughfares of the city should be entrusted to the tender and dearly purchased attentions of the department. We hope that while the Corporation are indulgent to the Electricity Department, they will also be merciful to the ratepayers, who, as a discussion in the Council last week showed, do not find the electrical prospect so bright as they could desire. We next turn to Leeds; and there it is found, as in many other places, that interest and redemption charges are outrunning the increment of profit. A gross profit of £56,052 was made last year, as compared with £49,537 the previous year. But, interest and redemption fund charges amounting to £55,770, the net profit is only £282, as against £3430 the preceding year.

Then it is seen that at Birmingham, though the receipts during the year increased by £1774, the surplus is only £377 more—the total being £10,789. At Burton-on-Trent, a considerable increase in works costs has brought the balance down to £357, compared with £1197 the year before. From Hull, it is reported that the number of units sold per 8-candle power lamp has fallen slightly—this being accounted for by depression of trade and brighter weather. At West Bromwich, there has been a drop of £200 in the net profit; the figure being £1327. The reduction is attributed to the lower charge for current for traction—not for private lighting. Batley has made a deficit of £334, which should be regarded as an encouraging improvement, seeing that in eight months of the previous year a deficit of £864 was the trading result. Lancaster has only made a net profit of £585, against £1507 the previous year. At Tunbridge Wells, the net profit on a revenue of £13,783, is only £736. Stockton has made a net loss of £227; and Kirkcaldy, one of above £400. Exeter is in a bad way; it having been found necessary to transfer £1217 from the reserve fund to the net revenue account, in order to provide a sum sufficient to pay sinking fund charges. From the same source, £5478 has been lifted to discharge an unsanctioned loan expenditure on machinery and building extensions. Swansea has made a net profit of £1271; and adding to this the balance brought forward gives a sum of £2016 in hand. But as £3125 has to be set aside (through neglect in previous years to make provision) for sinking fund, in compliance with the urgent requirements of the Local Government Board, the accounts of the concern show a deficit of £1109. If the annual financial returns of municipal electricity undertakings still to be published yield as many disappointments as those that have already seen the light this year, they will show that, even in many of those places where we usually look for prosperity in electricity supply, the past year has not been liberal in the dispensation among them of its favours.

During the recent discussion before Earl Camperdown's Committee of the great electric power schemes for London, there was an unnecessary redundancy of conflicting evidence as to the development of the motor load on the mains of existing London electricity undertakings. In view of this, the "Electrician" has done useful service in preparing and publishing some tables to show the horse power of motors connected to the mains of the companies and local authorities in the areas so far given to the Administrative County of London Company and the Metropolitan Electric Supply Company. The total horse power is 44,957 to the end of 1904, which is an increase of 40 per cent. on 1903. The total figure is not a startling one when it is seen that it comprises the whole of the power supply of 19 electricity companies and 31 local authorities—making together 50 separate electricity undertakings, and covering not only Greater London, but extending right away to places like Gravesend and Kingston-on-Thames. Out of the total, the fourteen London Companies account for 30,532-horse power at Dec. 31 last; but the thirteen London Borough Councils can only claim connections equal to 10,740-horse power. Going outside, we get some small figures—five suburban electricity companies only aggregating 594-horse power. Then the eighteen local authorities owning electricity undertakings (other than those of the London Borough Councils) within the areas of the Administrative County of London Company and the Metropolitan Electric Supply Company can only total 3091-horse power. Investors should ponder over these figures before committing money that they cannot afford to lose to the care of the ambitious Power Companies who are trying to drive their schemes through Parliament this session. By-the-by, the London County Council are circularizing Provincial authorities, pointing out that if the London Power measures become law, they are calculated to form precedents fraught with danger to local authorities throughout the country, and asking for co-operation with the London Authorities to secure the rejection of the Bill.

The almost melancholy plea of the General Manager of the Sheffield Corporation electricity undertaking (referred to in the first paragraph), that the Corporation should confide to the department the lighting of every municipally controlled building in the city, and that of the principal thoroughfares, does not look healthy. It certainly is not a sign of strength; but it is indicative of the department being sorely pressed by their chief competitor. It is one of the noticeable features of municipal electricity supply that while the Committees and their officials are compelled to trim down their own working expenses to the utmost fineness in order to make the financial issue of a year's working as decent looking as possible, they, on the other hand, have no prickings of conscience in endeavouring to help themselves as much as they can by assisting to create and foster leakages in other departments. In other words, the economy which they perforce must practise within, they shamelessly encourage outside; and hence it is that all the business they can gather in through the various municipal departments—in the lighting of the public buildings and the streets—they work to net, though it will cost the ratepayers more. As with street lighting, so with public buildings, the lighting by electricity, if it is properly done, is decidedly uneconomical. It could by incandescent gas-burners be done cheaper; and thus, in order to benefit the electricity department, numerous leakages in the public funds are created. Turn all these leakages into one channel, with the greater leakage that takes place on account of public lighting, and it will be found that they represent a goodly stream, to stem which would be of immense assistance in resuscitating municipal economy.

A glaring instance of how these leakages come and grow is supplied by a recent meeting of the Corporation of Croydon.

The report of the Sanitary Committee contained one by the Borough Electrical Engineer, on the question of lighting by electricity the Borough Hospital. That report was about as vague as a report could possibly be; the only thing definite about it being the estimate of the cost of laying the cables and doing the work needful to complete the installation. The items—totalling to £1057—were, cost for cables to the Electricity Department £382, cost of laying mains in the hospital grounds £170, cost of transformer and switch gear £85, and cost of installing the light between £400 and £420. The Electrical Engineer stated that the lighting would be "a great improvement" on the present system; but in the report as published there is not a shred of information to support such a statement. What can be thought of councillors who submit to being led about blindfolded in this fashion? We should have liked to see a computation of the illuminating power the Electrical Engineer is prepared to give (together with what the Gas Company could do) for a stated figure and number of hours' use. Though the figures might have varied to an extent with actual requirements, they would have been approximate enough to have been some guide. The anxious care of the Electrical Engineer not to commit himself is revealed when he says with regard to annual cost: "I do not think there is any reason why the electric lighting bill should exceed the amount now paid for gas lighting, even if it amounts to as much." What caution! Does the Electrical Engineer confess to incapacity to give an approximate idea of what the cost will be from experience as to what has been required in the past? It is surprising that the Council should allow themselves to be satisfied with such vagueness and evasion of responsible advice. Here, at this meeting, the Sanitary Committee stated that, after having given the matter careful consideration, they did not recommend the installation of the electric light in the buildings; and Alderman Lillico assured the Council that the Hospital Sub-Committee were perfectly satisfied with the light they had—the arrangement with the Gas Company being satisfactory and the light good. But, in the result, an amendment was carried by 22 votes to 15, forcing upon the Committee the establishment of the electric light in the hospital. Such is the way this and other municipalities encourage leakages of the ratepayers' money. What care the 22 Croydon councillors who voted for the amendment. Several of them are interested in the matter as members of the Electric Lighting Committee, and care not who pays for the lavishness so long as they can get more business for their department. The more economical gas supply, not being a municipal undertaking in Croydon, does not stand on an equal footing in the Council Chamber, and therefore cannot (in view of the number of members on the Electric Lighting Committee) effectually oppose this extravagance. And so in Croydon as in many other places, leakages of the ratepayers' money go on merrily just to benefit the electric lighting undertaking.

It is an old stratagem of electricity suppliers when starting working to try to scoop in business by offering free supplies of electricity to consumers for a given period; but the Tonbridge District Council are making a new and very questionable departure, against which the present consumers and the ratepayers should strongly protest. The Council have been in the electricity business for two years; and so far, as the ratepayers know to their cost, they have not made a brilliant success of it. Now they propose to encourage fresh connections by giving new consumers, during June, July, and August, a free supply for any number of lamps not exceeding twenty of 8-candle power, on the condition that the consumers so favoured continue to take a supply for twelve months from the expiration of the privilege, or, if anyone does not wish to continue a consumer after the three months' experience, he can get release by discharging the bill for electricity consumed at 6d. per unit, with the payment of meter-hire, and 10s. towards the cost of connection. Inasmuch as the undertaking is not flourishing in the manner the Council would prefer, this generosity on the part of the Council will have to be borne by the ratepayers—no matter the extent of the licence the free consumers choose to take—if the subtle scheme works its object; and they may inquire why they should bear, in addition to the burdens they already have, the private lighting expenses of some of their neighbours. It may also be suggested to the consumers who are caught in the net spread for them that the Council have, very cleverly, chosen for their little game the lightest three months in the year; and that therefore the use of current in that quarter will not be any criterion of the cost of electric lighting during the whole year. There is talk, too, of the action of the Council being illegal; certain it is that it is not covered by their statutory powers.

Mr. J. Barber, one of the Directors of the Harrogate Gas Company, who died on the 15th of April last at the age of 82, left estate valued at £38,679 gross and £34,022 net.

In accordance with previous arrangements, the Institution of Mechanical Engineers opened their summer meeting at Liége yesterday. In view of the fact that the Cockerill Company, of Seraing, are conspicuous as manufacturers of motors for the utilization of blast-furnace gas, special interest will no doubt be taken in a paper on "The Growth of Large Gas-Engines on the Continent," to be submitted by M. Rodolphe Mathot, of Brussels, whose work on "Gas-Engines and Producer-Gas Plants" was noticed in the "JOURNAL" for the 30th ult.

OBITUARY.

JAMES MANSERGH.

IT is with much regret that we record the death last Thursday morning, at his residence at Hampstead, of Mr. James Mansergh. The sad event was not unexpected; the health of the deceased having for the past few months been in such a condition as to cause considerable anxiety. It removes from the engineering world one who had for some years occupied a conspicuous position in it, and who, it was hoped, would live to fully enjoy the leisure which should be the reward of an active life. But this was not to be.

Mr. Mansergh was born at Lancaster on April 29, 1834, and consequently was in his 72nd year at the time of his death. He was the second son of Mr. John Burkit Mansergh. On leaving school he was articled to a firm of Surveyors (Messrs. M'Kie and Lawson) in his native town; and while he was with them, he obtained considerable experience in water-works construction. On the completion of his apprenticeship, in 1855, he went as contractor's engineer and district agent for the railway forming a link between Rio de Janeiro and the interior of the South American State. On his return to England, he entered into partnership with one of his former employers, in association with whom he carried out a sewage-disposal scheme—the first of the kind in England—at Carlisle. They also constructed sewerage works at West Ham. The partnership was dissolved in 1860, and very shortly afterwards Mr. Mansergh became contractors' agent for Messrs. John Watson and Co., who were engaged in the construction of railways in Wales. It was while employed there that he recognized the advantages of the district of the Elan and Claerwen Valleys as a watershed which might be utilized for the supply of Birmingham. At that time, the late Mr. (afterwards Sir) Robert Rawlinson was reporting to the then Birmingham Water Company on the subject of increasing their supply. Twenty years later, when the water-works had passed into the hands of the Corporation, the advice of Mr. Mansergh (who had succeeded to Sir Robert's connection) was sought; and he submitted to them the scheme which was completed and opened by the King and Queen on the 21st of July last year. In the minds of most people, Mr. Mansergh's name will be associated with this great undertaking, the execution of which occupied about twelve years. Fortunately, its author was spared to see the fruition of his labours, and to receive the congratulations of his Sovereign upon the success of his work. Not long afterwards, however, his health began to fail; and on this account he was unable to be present at the official visit early in October to the Frankley reservoir, which receives the water brought by the aqueduct from the gathering-ground near Rhayader.

Next to the Birmingham scheme, probably the most important water-works designed by Mr. Mansergh were those for Stockton and Middlesbrough, consisting of five service reservoirs, the largest holding 220 million gallons, a new pumping-station, 40 miles of conduit, filter-beds, and three storage reservoirs, utilizing the rainfall on 30,000 acres of the upper watershed of the Tees. The Bill introduced to sanction this scheme was the first case of the compulsory purchase of a water undertaking by a public authority; and the inquiry to which it gave rise occupied no less than 42 days. It resulted, however, as many of our readers may remember, in the passing of the Bill, and the constitution of the Stockton and Middlesbrough Water Board.

With the water supply of his native town Mr. Mansergh had been associated from the inception of the scheme; the original works having been carried out by Mr. John Lawson in the early fifties. He had no part in the first extension, in 1864; but his services were sought in connection with the further enlargement for which parliamentary sanction was obtained in 1876. These works were opened on May 5, 1881. Two years later he advised the construction of a reservoir to hold 50 million gallons, as contemplated by the Act of 1876; but one of 30 millions was decided upon, and completed in 1891. The curtailment of the scheme necessitated the construction of the Blea Tarn reservoir earlier than was contemplated. Mr. Mansergh was also engaged in negotiating with the Gas Company for the sale of their works to the Corporation in 1879. Another North Country water undertaking with which Mr. Mansergh was associated—less, perhaps, in a personal capacity than as the head of the firm (his two sons being in partnership with him)—was the new water scheme for Carlisle. As the result of difficulties in which the Corporation found themselves in connection with their Geltsdale scheme, they decided, in the spring of 1902, to retain Mr. Mansergh to report fully upon it, and particularly upon the watershed as a suitable source of supply for the city; the quantity and quality of the water, and the proposals for obtaining, storing, and conveying it to the city contained in their Act of 1898, the suitability or otherwise of the reservoir site, and the probable total cost of the construction of the works. He was also to consider the position of the city with regard to its water supply, and submit his recommendations for its extension and improvement. By the end of the year the report of the firm was in the hands of the Corporation; and, in the result, they were entrusted with the carrying out of the works.

To Mr. Mansergh's services to engineering it is unnecessary to refer in detail. It may be mentioned, however, that he acted

altogether for 360 municipal authorities. His advice and assistance were in request beyond the boundaries of the United Kingdom. In 1884, he visited the United States to report upon an important water scheme; and five years later he was commissioned by the Government of the Colony of Victoria to devise a scheme of sewerage and sewage disposal for the Metropolitan district of Melbourne. This scheme dealt with an area of 133 square miles, compared with 119 square miles, the area of the Administrative County of London. While in Melbourne he advised the Premier very fully on the draft Metropolitan Board Bill, which provided for the incorporation of twenty-three Local Authorities' districts with the City of Melbourne. The Bill became law, and the works were proceeded with; and the scheme has been carried out almost in its entirety, as recommended, at a cost of about £4,500,000. Other important works Mr. Mansergh advised upon out of the United Kingdom included sewerage or water supply schemes for Cape Town, Port Elizabeth, Buda-Pesth, Antigua, Philadelphia, Malta, Singapore, Naples, Toronto, and Colombo.

Possessing such experience in connection with water engineering, it is not surprising to find that Mr. Mansergh's services were eagerly sought in connection with the promotion or opposition of Bills in Parliament. It is estimated that his appearances before Committees of both Houses for the purpose of giving evidence reached the high total of 700. It was his wide range of knowledge that led to his selection as a member of the Royal Commission on the Water Supply of the Metropolis over which Lord Balfour of Burleigh presided in 1892-3. In 1878 he prepared, by special request, a scheme for the sewerage of the Lower Thames Valley drainage district, which comprised twenty separate local authorities and an area of 28,215 acres, and for it was awarded one of the three premiums given. The accepted scheme being rejected by the higher authority after a very long inquiry, he was instructed in 1883, in conjunction with Mr. J. C. Melliss, to devise another plan. This received the approval of the Local Government Board, but it was defeated in Parliament. The Thames Conservators in 1879 retained Mr. Mansergh in their arbitration with the Metropolitan Board on the question of the obstruction to navigation caused by mudbanks in the Thames near the two sewage outfalls; and in 1883 he was one of the principal witnesses for the City of London before the late Lord Bramwell's Commission on Metropolitan Sewage Discharge. The Commission requested him to lay before them his views as to remedial measures; and he suggested the mode of treatment which was afterwards adopted in principle. In 1885 he devised a scheme for carrying the sewage of the Lower Thames Valley district and of the suburbs on the west and north of the Metropolis and of the Lea Valley to works of precipitation at Mucking Flats, at the head of Sea Reach.

Mr. Mansergh was a member of several scientific bodies. He was admitted to the Institution of Civil Engineers as an associate member in 1859, and was transferred to the membership list in 1873. He was elected to the Council in 1885, and entered upon the presidency in November, 1900, in succession to Sir Douglas Fox. His address on that occasion was full of interest, as shown by the extracts from it which were published in our columns at the time. One specially noteworthy feature was his comparison of typical city water-works, and another his remarks on the subject of water-finding by the divining-rod, about which a good deal was heard at the beginning of the present year. It was during his occupancy of the presidential chair that the Engineering Congress was held in Glasgow; and the address he delivered on that occasion will be in the recollection of many of our readers. In the same period, the Engineering Standards Committee was formed at the instance of Sir John Wolfe-Barry, and Mr. Mansergh was elected Chairman. It was largely due to his exertions that the Committee obtained the co-operation and support of the Government. On the death of Sir Frederick Bramwell in 1903, he was made a member of the Advisory Board of the Institution. He was also on the Council of the Institution of Mechanical Engineers, which body he joined in 1875, and a Fellow of the Royal Society. He was High Sheriff of Radnorshire in 1901-2, and had been a Justice of the Peace for the county from the close of the last-named year. Early in 1903, he was presented with the honorary freedom of his native borough.

As already remarked, Mr. Mansergh's death was not altogether unexpected; but it will none the less be a cause of sincere regret by a large number of personal and professional friends. The funeral service will be held this (Tuesday) afternoon at New College Chapel, Avenue Road. The interment takes place at Hampstead Cemetery.

There will be general and profound sympathy among gas engineers with Mr. J. Stewart Dougall, the Engineer of the Boston (Lincs.) Gas Company, and President of the Eastern Counties Gas Managers Association, in the sad affliction which to-day is his. For some months past, his wife has been suffering from a serious malady. Doctors and specialists have been consulted; and, in the result, it was deemed imperatively necessary that there should be an operation. This the sufferer underwent at Hull last Friday week; but, in spite of all that could be done for her, it had a fatal termination last Tuesday. Mrs. Dougall was the daughter of Mr. J. M. Hamilton of Hull, and was 40 years of age. Amiable and winning in disposition, and aspiring always to make her husband's intimate professional colleagues feel that in their friendship she also shared, she had many friends in the gas industry. They, with us, mourn with Mr. Dougall, his children, and the relatives generally in their great loss.

Mr. Thomas Stewart, who was Manager of the Larkhall (Lanarkshire) Gas Company for more than twenty years, died there towards the end of last month. He was born in the parish of Larkhall sixty-five years ago. In his early life, he worked in the coal pits; but at the age of thirty-five he became a timekeeper in the Dalmarnock Gas-Works, Glasgow. He was afterwards employed in the Larkhall Gas-Works, of which he became Manager in 1881, but retired from that post about eighteen months ago. Mr. Stewart was never possessed of robust health. He was of a literary turn of mind, and published more than one volume of poems, besides contributing to the local Press.

FIELD'S ANALYSIS OF GAS ACCOUNTS.

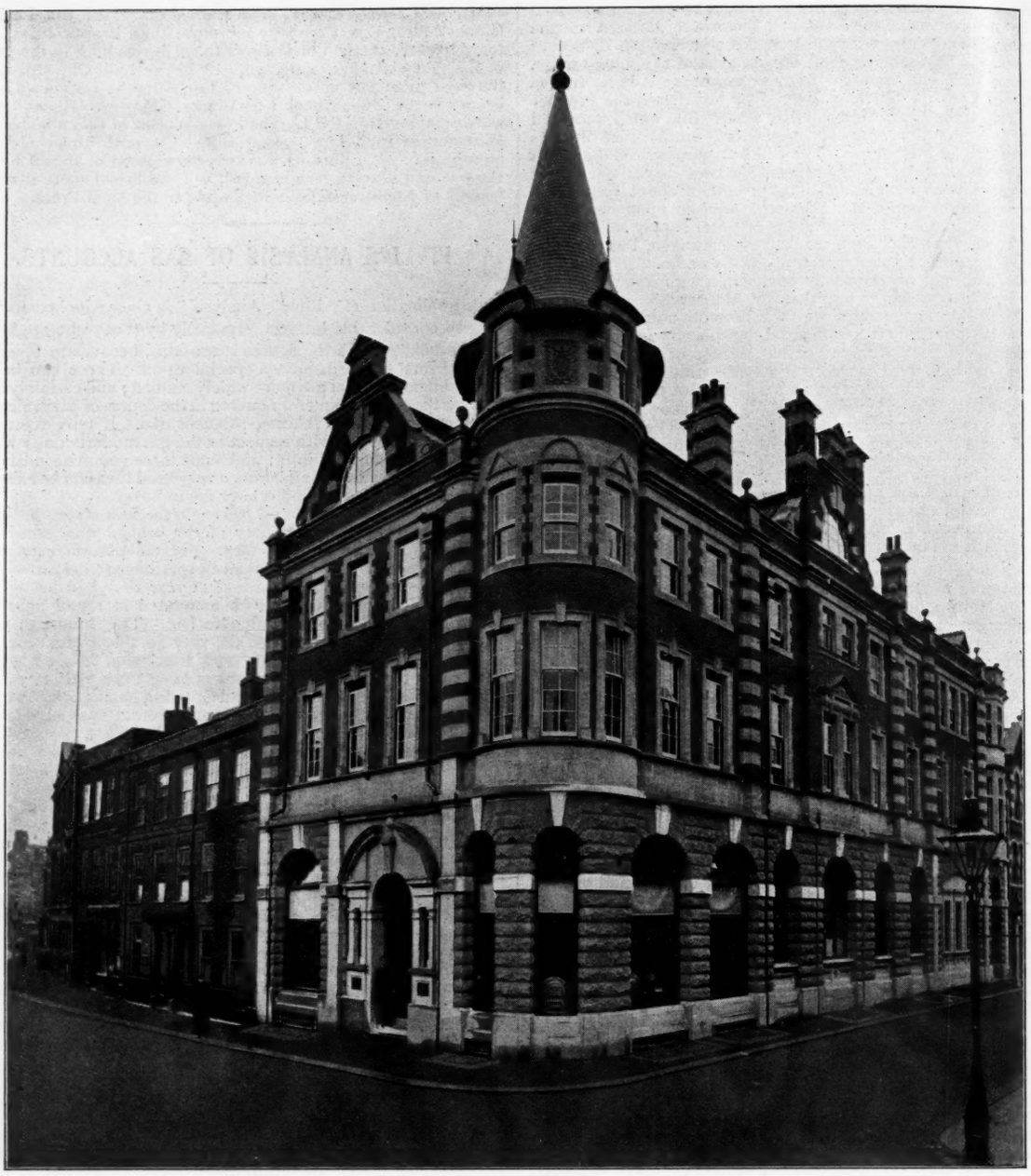
The publication of "Field's Analysis" is always looked forward to with considerable interest, especially by those who are in any way associated with the figures it contains, because to these the comparisons it affords have a special value. There can be few gas publications that are more widely studied; and certainly there is none that is so frequently quoted in the course of parliamentary or other proceedings relating to gas-works. It tells unerringly "what o'clock it is," with respect to the gas undertakings whose accounts are included in it; and since these comprise nearly all the leading ones in the kingdom, a very good idea can be gathered from it of the general condition of the industry.

The "Analysis" just issued shows, in the first place, that there was a very satisfactory recovery of gas consumption within the Metropolitan district during 1904. For the preceding year, the three Metropolitan Gas Companies experienced a decrease which averaged 0·56 per cent.; whereas last year they had an average increase of 2·98 per cent., which amounted in round figures to rather more than 1000 million cubic feet. The Suburban Companies had for the same period the very notable average increase of 6·89 per cent. Tottenham and Edmonton headed the list with 14·70 per cent.; West Ham coming next with 11·47, and Mitcham, Lea Bridge District, and Croydon having 9·82, 8·81, and 8·55 per cent. respectively. The only actual case of decrease is that of the West Kent Company, who have lost ground to the extent of 5·94 per cent., following upon a decrease for 1903 of 3·32 per cent. Turning to the Provincial works, the first thing that strikes the eye in the list of those belonging to Local Authorities is the comparative absence of decreases. Four out of the nine English undertakings showed a decrease in 1903, whereas only one does so for 1904. But the average increase of these undertakings has only risen from 1·42 to 1·89 per cent. It is evident that indifferent trade is responsible for the very moderate progress shown by these figures; the consumption at such an important centre of industry as Birmingham having increased by 0·67 per cent. only, compared with 1·97 per cent. gained during the preceding year. On the other hand, Glasgow shows a very gratifying increase of 3·31 per cent., as compared with only 0·79 per cent. last year; while the average increase of the Provincial Companies is 3·58 per cent., as compared with 1·49 per cent. last year. Sheffield, still suffering from depression of trade, is at the bottom of the list, with but 1 per cent. increase; but this compares with 1·21 per cent. decrease last year.

Turning now to the capital expenditure per 1000 cubic feet, it will be seen that this shows, on the whole, a fairly satisfactory improvement as regards the Metropolitan and Suburban Companies; the only cases of increases being those of the Commercial, Bromley, West Ham, and West Kent Companies. Of the undertakings owned by Local Authorities, Birmingham, Bradford, and Leicester show increases in this respect, in addition to Edinburgh and Glasgow, at both which cities large new works have been recently erected. The average of the Provincial Companies remains practically the same as last year; and it is noticeable that the exceptionally low figure of 2s. 10d. in the case of Rochester continues to be maintained.

No information is to be obtained from the "Analysis" of the cost of production to the various undertakings of carburetted water gas; but the Appendix shows that during 1904 considerably more oil was used for the production of this gas than during 1903—this being probably due to the influence of lower prices. In reference to the residuals, one begins to realize the difficulty experienced by Mr. Herring, and referred to in his paper on the "Results Obtained at the Granton Works," when on turning to the particulars of coke made, &c., it is seen that Birmingham produces absolutely the smallest quantity per ton of coal carbonized of all the undertakings included in the analysis, and is at the same time lowest but one in fuel consumption, and lowest but three in quantity of coke made for sale. Is the coal used at the Birmingham works of such an exceptional nature as to produce so little coke as 10 cwt. per ton, and are the retorts heated with such a degree of skill as to be an example in economy to the rest of the country? Birmingham, it is to be noticed, heads the list in regard to yield of ammoniacal liquor; while Portsea and Rochester share with Hornsey the somewhat doubtful honour of being at the other end of it. These are among the matters of interest revealed by this "Analysis" to which, however, space will not permit us further to refer.

NEW GAS OFFICES AND SHOW-ROOMS AT READING.



The Reading Gas Company's New Offices and Show-Rooms.

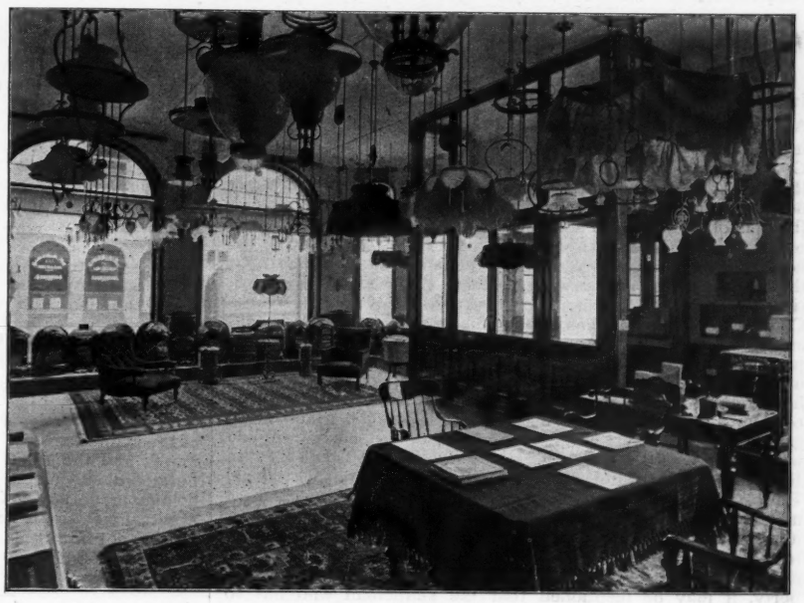
On the occasion of the visit of the Southern District Association of Gas Managers to the Reading Gas-Works last summer, particulars were given of the great increase that has been taking place in the Company's business. These were extracted from a pamphlet prepared by the Engineer and Manager (Mr. Douglas H. Helps), who was the President of the Southern Association; and they showed that the make of gas had risen from 38 million cubic feet in 1863-4 to 477¼ million feet in 1903. In order to cope with the growing demands made upon the undertaking, the new works, which were at the same time described in the "Journal," were erected; and following upon this, the Company have built, and recently opened, the handsome offices and show-rooms shown in the accompanying illustration, which present a frontage of 102 feet to Cross Street and 40 feet to Friar Street.

The whole of the ground floor of the building is constructed of Grey Royal granite, which was worked in Norway to the detailed drawings of the Architect (Mr. G. W. Webb), and shipped to England and fixed by the Contractor (Mr. H. W. Godwin) at half the price of Aberdeen granite; red brick and stone being used for the remainder. A prominent feature is the circular angle tower, which is 90 feet in height to the top of the vane. Entering from Friar Street, one steps into a large show-room in which are displayed gas-fires, geysers, brackets, burners, globes, and silk shades in various designs and sizes. Specimens of lamps for outside lighting, gas arc lights, &c., are to be seen, ranging from 60-candle power to 300-candle power, and even larger; the Company making a speciality of this class of lighting. There is an ample stock of all kinds of accessories which gas consumers use; the Company undertaking the supply and fitting of all such articles. From this room the visitor passes into the general office, on the right of which is the Secretary's (Mr. A. Canning Williams) private room, and on the left that of the Assistant Secretary. At the back of the general office is a separate room provided for the prepayment meter clerks. A hat and coat room, fitted with a range of lockers for the use of the staff, is provided; as well as a cycle room. The basement contains a show-room for the larger and heavier articles, such as gas-cooking stoves, &c.; and it is proposed to instal a specimen gas-engine. The strong-room is placed in the basement, with a lift adjacent which travels from the bottom to the top of the building, so that books can be conveyed with the least possible trouble. Stationery stores and lavatories are also arranged there; the basement being lighted and ventilated by a large open area at the back. The walls are lined with white glazed bricks; and communication with the upper floors is obtained by two stone staircases.

On the first floor, facing Friar Street, is a room whichwill be used by the Auditors; and adjoining this, facing Friar Street and Cross Street, is another room which is to be the Board-room, on

the walls of which are to be seen portraits of the present and past Directors and head officials of the Company. On the same floor, besides additional offices and smaller rooms to be used for minor purposes, there is a spacious room to be known as the lecture room. It is capable of accommodating some 150 persons, and will be used for giving lectures periodically on the use and misuse of gas, and on cooking, &c. The greater part of the second floor is devoted to providing accommodation for the caretaker. The rooms set apart for his use comprise a kitchen, scullery, pantry, sitting-room, bedrooms, and a bathroom; while two large rooms on this floor are reserved for the use of the Company as occasion may require. On the third floor provision is made for various rooms, should they be needed; and a cistern capable of holding 500 gallons of water is ready in case of fire. The whole of the premises are heated entirely by gas.

For the loan of the illustrations (which were prepared from photographs taken by Messrs. Dann and Lewis, of Reading) we are indebted to the proprietors of the "Reading Standard," who in last Saturday's issue devoted a considerable amount of space to an account of the Company's work, as well as of a presentation to the Chairman (Mr. J. Okey Taylor, J.P.), which is noticed in another column.



View of the Reading Show-Room.

Another View of the Reading Show-Room.

Southern District Association of Gas Engineers.

Dorking, where the President (Mr. Samuel Carpenter) is located, is to be visited by the members of the Association on Thursday, the 29th inst. It is to be hoped the weather will be kind on that occasion, for the arrangements which the President and the Committee have made, combined with the lovely country, only need to be supplemented by fair weather to perfect the enjoyment of the visitors. Dorking will be reached just about noon; and conveyances will be in attendance at the station to drive the visitors to the gas-works, where an inspection of the plant will be made. The address with which Mr. Carpenter inaugurated his year of office gives promise of the members finding much incorporated in the works which will be of considerable interest to them. After the inspection, there is to be a luncheon, at which the members will be the guests of the Chairman and Directors of the Dorking Gas Company. The third feature of the programme is a drive to Leith Hill, *viâ* Westcott and Wotton, returning *viâ* Coldharbour to the Burford Bridge Hotel, where high tea will be served. By permission of Her Grace Lily Duchess of Marlborough, a visit will be paid to Deepdene.

MEETING OF THE BELGIAN ASSOCIATION OF GAS ENGINEERS.

The programme for the recent meeting of the Institution of Gas Engineers informed members that the annual meeting of the Association of Belgian Gas Engineers was to be held at Liége early in July, and that a cordial invitation to attend the meeting was extended to all members of the Institution. A provisional programme was given, and this may now be supplemented by further particulars contained in the full programme since received.

The meeting commences on July 3, when there will be a reception at four o'clock in the afternoon (at a place to be afterwards intimated to those who express their intention of being present at the meeting); and at six o'clock there will be a banquet given by the Belgian Gas Association. The following day—Tuesday, July 4—the party will leave Liége at nine o'clock a.m. for Spa, where, on arrival shortly after ten o'clock, carriages will be in waiting to convey the excursionists for a drive through the town and suburbs. After luncheon at Spa, and further time spent in the town, the party will return to Liége in time for a visit to the Exhibition and dinner there in the evening. On July 5, at nine o'clock, members will assemble in the Place St. Lambert, where carriages will be in waiting to take them to Vennes, to visit the iron foundries of the Compagnie Generale des Conduits d'Eau; afterwards driving back to Liége, where luncheon will be served in the Restaurant du Lac. At three o'clock the same afternoon, members will leave by tram for the Bayards Gas-Works, where a gasholder of 50,000 cubic metres capacity is being erected. At six o'clock, a banquet is to be given by the Société du Gaz de Liége.

It is announced that ladies of visitors will be free to take part in the banquets, as well as in the excursions. Members will have to make their own arrangements in regard to hotel accommodation, and are reminded to apply as soon as possible. A list of hotels is given below. The Secretary of the Society (M. Em. van Heede) should be communicated with at once by any intending to be present at the meeting.

List of Hotels.

Grand Hôtel (Becker-Berger), Place St. Lambert.
Hôtel de Suêde (Michotte), Rue de l'Harmonie, 7.
Hôtel de l'Europe (Henrard), Rue Hamal, 4.
Hôtel d'Angleterre (Bodson Sœurs), Rue des Dominicains, 2.
Hôtel de l'Univers (Bernard), Rue des Guillemins, 112.
Hôtel du Chemin de Fer (Wiser), Place des Guillemins, 11.
Hôtel de Dinant (Sauvage), Rue St. Etienne, 2.
Hôtel Mohren (Mohren and Cie.), Rue du Pont d'Avroy, 31.
Hôtel Venitien (Verlhac), Rue Hamal, 2.
Hôtel de la Pommelette (Bischof), Rue Souverain Pont, 44.

METER-RENTS IN NON-PROVIDED SCHOOLS.

It may be remembered that in the "JOURNAL" for the 18th of April (p. 150) reference was made to a difficulty which had arisen, in the case of a gas supply to a non-provided school, owing to a County Council, who had taken over the education work under the Act of last year, striking out of an account the items put down as meter-rent, on the ground that they were a liability of the School Managers, in accordance with a decision of the Board of Education. The facts were set forth in our columns in the hope that some of our readers might be in a position to enlighten the correspondent who forwarded them as to whether this decision had the effect of overriding the provisions of the Gas-Works Clauses Act, 1871, sections 13 and 18 of which require every consumer of gas to pay for the hire of his meter while this is the property of the supplier. He also sought advice as to the steps he ought to take in the matter. No information, however, came to hand; and our correspondent consequently addressed the Board of Education, but without success. He thereupon asked to be granted an interview; and his request was courteously complied with. The result was the drafting by the standing Counsel to the Board (Mr. H. M. Lindsell) of a fresh circular (No. 506) to local Education Authorities, with a view to putting the question of meter-rents upon a proper basis; and we reproduce it below, as it may be of interest to other suppliers of gas situated similarly to our correspondent. As the matter has now been sufficiently cleared up, and the Board of Education circular is public property, it may be mentioned that the gentleman who has so successfully interested himself in getting the decision in question is Mr. T. H. Hazell, the Secretary of the Newport (Mon.) Gas Company.

METER-RENTS.

The Board of Education have had numerous inquiries addressed to them as to whether the local Education Authority or the Managers are liable for the rent of meters used for measuring gas or water supplied for the use of a Public Elementary School.

In cases where the opinion of the Board has been asked as to the respective liabilities of Managers and local Education Authorities in connection with the supply of gas or water, the Board have advised, without prejudice to the determination of any specific question under section 7 (3) of the Education Act, 1902, that, in their opinion, the local Education Authority were liable for the cost of the actual gas or water consumed, and that the Managers were liable for the cost of the means and appliances whereby the gas or water was brought to the school, as part of their duty in providing the school-house free of any charge. As a consequence of this view, the Board have, in certain cases, advised that the rent of meters came within the province of Managers.

The Board have, however, been given to understand that considerable practical inconvenience has arisen from the adoption of this view, from the fact that the public bodies who supply gas or water by meter include the rent of meters in their charges for gas and water consumed, and look for payment to the consumer as distinct from the owner or occupier. It is pointed out that any adjustment of the charges made by the companies between the local Education Authorities and the Managers would be practically impossible. The statutes, moreover, dealing with the question of meters appear to contemplate the payment of rent for them by the consumer. Under these circumstances, the Board of Education are disposed to reconsider the opinion previously expressed, and to advise local Education Authorities that they should pay the meter-rents as part of the gas or water consumed.

Of course, in cases where part of the gas or water, as measured by the meter, is used by the Managers at times when the school is not being maintained by the local Education Authority, the Managers should be required to pay a proportionate part of the meter-rent, as well as of the gas or water actually consumed.

GAS-ENGINES AT THE LIÉGE EXHIBITION.

From accounts that have lately reached us of the exhibition which is now being held at Liége, and which will be visited by the members of the Belgian Association of Gas Managers and the Société Technique du Gaz en France early next month, there is little to be seen that is specially noteworthy in connection with the gas industry. There is one feature, however, to which this remark is scarcely applicable, and that is the group of gas-engines by the John Cockerill Company, of Seraing, which stand in an enclosure at the south end of the Machinery Hall in the Belgian Section. It is now close upon a hundred years since the founder of this gigantic concern, after whom it is named, first put up engine works at Seraing; and such has been their development that they now combine under one management coal mining, iron smelting, steel making, and machine construction. Some few years ago, two of the Company's Engineers, in conjunction with the late M. Delamare-Debouteville, induced the General Manager to undertake the construction of large gas-engines for the direct utilization of blast-furnace gas; and it is estimated that, when used in this way, the gas exerts five times the power it affords when it is simply employed for firing boilers.

The largest engine shown is of the horizontal kind, and is of 1200 effective horse power. It is a four-cycle double-acting tandem engine for consuming blast-furnace gas; the cylinders being 39 inches in diameter with a 43-inch stroke, and the speed 100 revolutions per minute. Close to this is a horizontal 500-horse power four-cycle double-acting twin-cylinder engine, for coke-oven gas, built for the Company's electricity distribution service, and is supplied with ordinary gas. The cylinders are each 24 inches in diameter, with a 31½-inch stroke; and the speed is 135 revolutions per minute. The cylinders of both engines are of cast iron, with cast-iron covers; they are water-jacketed in the usual way—large openings being provided in the outer casing for cleaning-out purposes. The guide-farming is bolted to the cylinders; the crank-shaft bearings are of cast iron, lined with white metal, and are adjustable for wear. The engine is provided with an outside bearing. The pistons are of cast steel, with cast-iron packing-rings. The piston-rod is hollow, of forged steel, supplied with water circulation, which in the tandem engine extends to both pistons. The crosshead slides are of cast iron, lined with white metal. The connecting-rod is of forged steel. The crank-shaft is built up, and consists of forged-steel pin and shafts, with cheeks of cast steel in one piece with the counterweights. The Company also show a vertical 150-horse power twin cylinder engine for blast-furnace gas. The diameter of the cylinders is 12·75 inches—the length of stroke being 1 inch more; and the speed is 280 revolutions per minute. A small horizontal single-acting gas-engine, which also forms part of the display made by the Company, is of interest from an historical point of view, as it was built by them for the experiments they carried out in 1895 and 1896 with the object of testing the applicability of blast-furnace gas for use in internal combustion motors.

PERSONAL.

We learn that Mr. Ernest Heald has resigned his position as Secretary of the River Plate Gas Company, Limited, and that Mr. Henry T. Adkins has been appointed Acting-Secretary.

The Directors of Messrs. Ashmore, Benson, Pease and Co., Limited, of Stockton-on-Tees, have appointed Mr. Thomas P. Barker, M.I.Mech.E., lately General Manager of Messrs. Thomas Piggott and Co., Limited, to the post of General Manager of their works. Readers will remember our previous announcement that Mr. R. Seymour Benson, the former Managing Director, had decided to resign his position with the Stockton firm.

On Friday, the 9th inst., an interesting ceremony took place at the Rochdale Road Gas-Works of the Manchester Corporation, when Mr. J. S. Naylor, formerly Manager of the station, and now Engineer and General Manager of the Rotherham Corporation Gas Department, was presented by the officials and workmen with an illuminated address and a handsome flower and fruit epergne. The presentation took place in the workmen's dining-room, which has recently been erected at the station. Mr. G. W. Tooley, the newly appointed Manager, took the chair, and asked the Chief Engineer (Mr. J. G. Newbigging) to make the presentation. Speeches were delivered complimenting Mr. Naylor upon his appointment, and recognizing the good feeling which had existed between him and the workmen during the time he had charge of the station. Mr. Naylor suitably responded.

A pleasing function took place at a recent meeting of the Directors of the Reading Gas Company, when a presentation was made to Mr. J. Okey Taylor, J.P., the Chairman, by his colleagues, on the occasion of the eightieth anniversary of his birth and the jubilee of his position as a Director of the Company. Mr. Arthur Hill, J.P., who, in the absence of the Deputy-Chairman, made the presentation, said it was in 1855 that Mr. Taylor was elected a Director; and in 1857 he was appointed Chairman. They were therefore celebrating his jubilee in connection with the gas supply of Reading; and as a slight memento of the occasion they asked his acceptance of an address and his portrait, with the members of the Board and the principal officers. They also wished to congratulate him on another matter—namely, the eightieth anniversary of his birthday. Mr. Taylor, in thanking the Directors for the picture and address, said he should always look upon the picture with the greatest pleasure; and he thanked them very much for the kind address which accompanied it. They had a Board well able to conduct the business of the Company. In Mr. Douglas Helps they had an able Engineer and Manager; and the Secretary, Mr. A. C. Williams, well and worthily performed his duties—both being well supported by their respective staffs. Mr. Helps and Mr. Williams, on behalf of themselves and their staffs, added their congratulations, for which Mr. Taylor thanked them.

Manchester and District Junior Gas Association.—The next meeting of the Association will be held on Saturday, when a visit will be paid to the Littleborough Gas-Works, the retort-settings at which are now being converted from the direct-fired to the regenerative system. At the close of the inspection, conveyances will take the party round Hollingworth Lake; tea being served at the Lancashire and Yorkshire Hotel. The arrangements in connection with the visit have been made by Mr. S. E. Halliwell, the Manager and Secretary of the Littleborough Gas Company, who was the first President of the Association.

CONSUMERS' GAS-METERS.

At the last Meeting of the American Gaslight Association, a paper on the above subject was read by Mr. B. H. Spangenberg, the Superintendent of Meters at the Philadelphia Gas-Works. It was of too elaborate a character to be given in full in our columns, but its principal features are brought out in the following abstract.

The writer says that though in recent years there has been some discussion of the non-uniformity of consumers' meters, but little progress has been made towards establishing any standard. He believes the present type of dry meter will continue to be used for a sufficient length of time to warrant an earnest effort at standardization. It is undoubtedly most important that, for a certain estimated consumption per hour, the proper size of meter should be installed to safely and surely supply the quantity of gas needed, and to supply it without perceptible fluctuation of flame. It is also important, should any derangement occur in the meter while in use, that it may be removed and replaced by another of the same dimensions, of exactly the same-sized connections, and of the same capacity for delivery. It is further important to the gas manager that, for a particular size of meter-case—that is, for a meter occupying a certain space, determined from its outside dimensions—this size of meter should be so designed and built as to be able to deliver the greatest quantity of gas per hour which it is possible for it to deliver, consistent, of course, with correct registration of the quantity so delivered. It is of equal importance that meters should be so designed and constructed as to give the greatest length of service before requiring repairs, and that when repairs become necessary they can be made with the least possible expenditure of time and money.

In order to show very conclusively the difference between the capacities of meters as made by different makers, and the lack of uniform relations between rated and actual capacities, the quantity of gas each meter would pass with differential pressures of 3-10ths, 4-10ths, and 5-10ths of an inch respectively, was determined for 350 each of 3-light, 5-light, and 10-light meters, and 210 each of 20 light and 30-light meters; the order for each size having been divided equally between the same seven makers. The following table gives a summary of these tests; all the figures shown being the average of tests on each make:—

Size.	Loss in Pressure.	Maximum Capacity.		Minimum Capacity.		Difference per Rated Light.	Average Capacity.	
		Per Hour.	Per Rated Light.	Per Hour.	Per Rated Light.		Per Hour.	Per Rated Light.
	Inch.							
3-light	0·3	44·17	14·72	28·37	9·46	5·26	39·45	13·15
	0·4	61·62	20·54	45·84	15·28	5·26	54·60	18·20
	0·5	77·17	25·72	58·68	19·56	6·16	66·82	22·27
5-light	0·3	81·35	16·27	53·18	10·64	5·63	67·53	13·51
	0·4	94·67	18·95	66·30	13·26	5·69	81·94	16·39
	0·5	110·10	22·02	80·97	16·19	5·83	95·84	19·17
10-light	0·3	121·10	12·11	83·02	8·30	3·81	97·85	9·78
	0·4	147·40	14·74	104·54	10·45	4·29	121·00	12·10
	0·5	171·86	17·19	124·44	12·44	4·75	141·84	14·18
20-light	0·3	181·66	9·08	99·20	4·96	4·12	147·43	7·37
	0·4	218·70	10·93	139·30	6·96	3·97	187·15	9·36
	0·5	252·44	12·62	165·26	8·26	4·36	218·04	10·90
30-light	0·3	242·50	8·08	177·70	5·92	2·16	198·59	6·63
	0·4	290·96	9·70	219·58	7·33	2·37	244·46	8·15
	0·5	341·92	11·40	260·38	8·68	2·72	287·53	9·58

The maximum difference between individual meters bought for this test was 80 per cent., and between other meters bought at various times 100 per cent. This wide difference in the capacities of meters of the same nominal sizes renders very difficult the selection of the proper size of meter for any installation of burners (including all gas-using appliances). The proper size of meter depends upon the number of cubic feet of gas required per hour. The determination of this quantity may seem to be a comparatively easy matter; and it probably would be, if the head of the department responsible for it could give each case his personal attention. But in a business of even small magnitude, this is not always possible. It therefore becomes necessary that the manager should prepare a schedule which shall state definitely the size of meter that must be set to meet the requirements of each new applicant. As the man who actually does the work of installing the meter does not generally come in contact with the manager, and as the latter cannot inform himself of the requirements of each new applicant, it is advisable to have the schedule printed and placed in the hands of the man who must decide in each case which is the proper size of meter required. In preparing such a schedule, the consumption in cubic feet per hour of the various gas appliances met with, must be known; and the manager must decide, under the conditions met with in practice, what percentage of the total possible consumption need be provided for. He must also determine what loss in pressure through the meter should be allowed for. Experiments in this direction give the following results: With 0·7 inch loss, nearly all meters, as now made, show fluctuations of flame; with 0·6, 0·5, 0·4, and 0·3 loss, the flame is steady; while with 0·2 inch loss, the capacity falls rapidly, and with 0·1 inch loss very rapidly, in percentage. Therefore, unless the manager is handicapped by a low street-main pressure, he should figure on a loss through the meter of 0·5 inch.

Assuming that this loss is decided upon, as being the differential pressure at which capacities will be determined, the troubles of the manager have but just begun, unless he is starting new gas-works, and intends buying all his meters from one manufacturer, with specifications to make all of one size from the same patterns. As such a case is hardly likely to occur, it is necessary to go back to the usual condition, and imagine the manager struggling with this proposition: Ten separate and distinct makes of 3-light and 5-light meters, and so on with eleven other sizes, and from one to three different capacities for each size of each of the ten different makes, brought about by improvements made from time to time by each maker, but unfortunately no mark of any kind visible to distinguish the improved from the unimproved ones.

The determination of the proper size of meter for any estimated consumption is indeed a knotty problem for the manager. Should he be very conservative, and decide that the quantity deliverable by the 3-light meter of smallest capacity is the greatest that he will allow for any 3-light meter, he will not derive from those of greater capacity their full quota of service; and, as the 3-light of greatest capacity may be equal to delivering more than the 5-light of smallest capacity, a 5-light may be installed where a 3-light would answer better. He may now try to base his schedule on that capacity of any one size which is the largest percentage of his stock of that size, provided again that he is able to determine this latter figure, and that it will never change—two very important things. But even should he accomplish this, he may again get into difficulties. Suppose, for instance, that 75 per cent. of his 3-light meters made by one manufacturer have a capacity of "A" cubic feet per hour, he would then decide to base his schedule for 3-lights on this. Then he finds the capacity of 75 per cent. of his 5-light meters, made by another manufacturer, to be also "A" cubic feet per hour or less. What is he to do? He cannot, without stultifying himself, issue a schedule that will allow as many or more burners to a 3-light meter than to a 5-light meter. He must perforce base his schedule on his 5-light of smallest capacity, and thus fail to derive proportionate service from his 3-light of greatest capacity, as well as failing to derive from his 5-light meters of greatest capacity their full quota of service. This would be true of all the other numerous and unnecessary sizes; and ultimately he fails to derive from a large percentage of his meters their full proportion of service.

To most fully utilize meters of varying capacities but of the same nominal sizes, the most feasible plan appears to the writer to be to designate them by sizes and serial letters. For instance, considering the 5-light size, at 0·5 inch differential pressure we find that certain 5-light meters will deliver 65 cubic feet per hour, others 80 cubic feet, others 95 cubic feet, others 110 cubic feet, and others 125 cubic feet. Rate the first class as 5-light "A," the second class as 5-light "B," the third class as 5-light "C," and so forth. This method of rating would indicate the size of connections where a change of meter was ordered, also the actual capacity of the meter to be replaced. It would allow of indefinite expansion up to the final obtainable capacity through a certain size of unions, often obviating a change in the meter-connection piping. This system could be applied gradually to very old meters, as well as to new ones—to the former, by ascertaining the capacities of all meters when brought in from service, and badging each with its appropriate serial letter; to the latter, by getting the manufacturer to mark in a similar manner the new meters he may supply.

The writer then sets forth the importance, from the standpoint of economy in placing meters, of their main dimensions and the distance between the centres of the inlet and outlet connections being standard. He shows by a table how widely these distances vary. When the distance between the centres is not the same, there is a great temptation to the man changing the meters not to change the connecting pipes, but rather to try to make the old piping do for the new meter. He will bend this old piping until the two parts of the unions are brought together; but the chances are all against perfect alignment of the unions. This makes no difference to him, and the cap of the union is screwed down until the joint becomes gas-tight, throwing excessive lateral strain on the screws and on the columns of the meter. It is only a question of time for this strain on the soldered joints to cause leakage of gas. This entails another change of meter, and unless the old piping is finally altered by a conscientious workman, this changing of meters for leakage may be continued indefinitely at this one place. The variation in the depths of meters may also cause like effects.

The author speaks of the great benefit derived from the recent standardization of meter screws and unions, and illustrates by a drawing a new form of screw, the use of which, due to its larger area of contact with the meter side pipe, is expected to very greatly decrease leaks at the screws.

Mr. Spangenberg then deals with the internal parts of the meter, beginning with the diaphragm. Up to the present time, "full sheepskin" (being that from which the fleshy part has not been removed by a splitting knife) is the best materia found. The skin consists of two layers—the outside, or grain side, known as the "skiver," and the flesh side, or "flesher." The skiver is very porous, liable to crack, and more readily loses the oil. When a filling-preparation is put in to overcome the porosity, the particles of the preparation are carried by the gas and lodge on the valve

seats. Even full sheepskin must be oiled to overcome porosity; and, provided the oil will stay, this material would be very satisfactory. The oil, however, drops out, leaving the diaphragm porous; or the diaphragm becomes soaked with moisture condensed at low temperature from the gas, and afterwards dries out at high temperatures, leaving the leather hard, and causing it to crack.

He believes that the size of the diaphragm should be such that it will not touch the meter case at any point; especially should it clear the bottom of the case. As is well known, a better condenser than a gas-meter could not well be designed. For a large portion of each year the temperature of the cellar air surrounding the meter is at a lower point than the gas coming from the street. As soon as this gas strikes the outside case of the meter, condensation takes place. According to the quality of the gas, this condensation may be thick or thin. In the former case, the diaphragm drags heavily, and loss in pressure runs up rapidly. Should the condensation harden to the consistency of glue, the leather is practically glued fast to the case, and eventually cracks at the point where the gluing action ceases. Fortunately, the meters which the writer is called upon to repair are not found to be in this condition; but he has heard of meters so affected. Should the condensation be thin, a corrosive action, which has an effect on both the diaphragm and the tin case, will occur, destroying the diaphragm and rusting the bottom of the meter. This action also takes place, but not to so great an extent, at any other point where the leather comes in contact with the metal. It occurs to such an extent that in Philadelphia it was decided several years ago to abandon the regular size diaphragn, and substitute a smaller one, which would clear the case at all points. At least 85,000 meters are now so equipped. The results have been exceedingly satisfactory. The change is not difficult or costly when it is made at the time a new diaphragm repair is necessary.

The only objection advanced against the smaller diaphragm is that it means excessive speed of the meter. Up to the present time, the writer has not been able to obtain a definite answer to the question: "What is excessive speed in a gas-meter?" The nearest approach to such an answer was: "Meters should not be run at much, if any, greater speed than they are now;" but no logical reason has yet been given for such an answer. The fact remains that at least 60,000 5-light meters are now operating in Philadelphia at eight revolutions per cubic foot instead of six, which latter is the usual speed of 5-light meters. Personally, the author believes that the limit of speed will have been reached only when the limit of endurance of the metals and diaphragm materials has been reached. To ascertain these limits of endurance would not be an exceedingly difficult matter. Having determined them, an ample factor of safety could be allowed, and a safe working speed defined. He has not done this, for the reason that he feels confident that any speed which is found to be obtainable, through meters of the present outside dimensions with existing sizes of meter unions, will still be far below safe working speed. Should future developments prove him wrong, it will not be a difficult matter to reinforce the weak places that would prevent higher speed. The effect of using the smaller diaphragms has been to increase the capacity of the meter; for the slightly greater frictional loss due to higher speed is more than set off by the removal of the friction formerly existing between the leather and the case.

The flag-wire should be of larger diameter, in order that the centres of its extreme ends shall always remain in their original plane of perfect alignment. This condition cannot be maintained with too light a flag-wire, which will bend out of line when the meter is called upon to do extra work. All connecting levers should be made of hard metal, and have longer bearing surfaces where rotation or partial rotation occurs. All stuffing-boxes should be made longer. This is especially important, since it has been found necessary, in order to ensure the tightness of the meter at all points, to subject it to from 2 to 4 lbs. pressure prior to accepting it as being gas-tight. All meters should have the valves set so as to make the tangent rotate towards the right, for the reason that all stuffing-box caps have right-hand threads. When the tangent rotates to the left, there is a tendency to screw the cap out of the stuffing-box, and thus start a leak through the latter. This actually occurs in practice.

These suggestions cover only those parts of the mechanism which affect the permanency of correct registration. For this reason, the proper design and proportions of parts, as related to the work to be done by them, should be carefully worked out, and a uniform standard adopted for each size of meter.

The writer describes some meters constructed as a result of experiments which began in 1903, by fitting twenty 5-light meters (two sets of ten) with small diaphragms, and with valves, forked channels, and diaphragm channels of 10-light size. The inlet and outlet openings under the table and the opening through the table were enlarged. The difference in capacity before and after the change was as follows:—

	Average of First Set.	Average of Second Set.
3-10ths inch loss in pressure—		
Before	54·7 cub. ft.	59·9 cub. ft.
After	78·6 ,,	91·1 ,,
5-10ths inch loss in pressure—		
Before	81·1 ,,	89·5 ,,
After	121·4 ,,	130·1 ,,

Similar changes made in 3-light meters showed a proportionate increase in capacity; and as a result of the work, it was decided to make a thorough investigation of the increased capacity possible of attainment in each size of meter, using the existing case, but making the diaphragm clear it, and enlarging the valves, ports, and channels. Assuming that the size of the meter unions has been chosen as the basis for rating the size of the meter, the quantity of gas that will pass through these unions in one hour, with a certain loss in pressure, is, of course, the greatest bulk that can pass through the finished meter and unions in one hour with the same loss in pressure. If the other passages through the meter—namely, the columns, the opening into the long channel, the long channel itself, the opening from it to the valve-box, the minimum opening of the valves, the pocket or diaphragm channel, the fork or Y channel, and the opening therefrom into the outlet column—are made of sufficient area to pass without further appreciable loss of pressure the gas that will go through the unions, the maximum limit of capacity per hour will have been reached. From this, deduct the amount absorbed by friction in operating the moving parts, and the balance will be the net capacity per hour of the meter. All passages can be made of sufficient size to accomplish this, except the passages through the valves. The maximum size of the valves is limited, first, by the distance across the table top; and, secondly, by the size of the discs and diaphragms which drive the valves, as the larger the latter are, the larger the discs must be to develop power to drive the mechanism. Experiments have shown that in practice the size of valves is governed only by the size of the table top.

Six meters each, of the 3, 5, 10, 20, and 30 light sizes, were constructed so as to learn by actual experience the maximum capacity obtainable from present case dimensions. In these meters, the long channel was placed on the top instead of underneath the table. This admitted of a larger area for this channel, saved one bend of 90° in the gas flow, gave more space underneath the table for enlarging the diaphragm channels, and made room for the diaphragms so that they would not come in contact with the metal at any point. The depth of the table was extended slightly; but the over-all depth of the meter was not lengthened. No other changes, except enlarging the valves and channels, were made; but the most practicable forms of valve-seat, and proper proportions of it under the valve, were carefully worked out.

As the construction of each meter proceeded, all sections of the channel, commencing with the meter screw, were tested for capacity. One fact established by this sectional testing was that all overlapping edges at the seams should be away from the flow of gas—that is to say, the gas passing through the meter should not flow against a raised edge, but over it. Quite a difference in capacity value was noted where the raised edge was first against the gas current and afterwards changed to the opposite direction. Solder, carelessly allowed to flow through a seam, and making a slightly raised obstruction on the inside of the channel, was observed to have the same effect. This fact is mentioned only to show that very slight obstructions will cause considerable difference in capacities, and that great care should be taken to prevent the careless jointing of the channel seams.

The capacities obtained from these meters were as follows:—

Gas Passed per Hour.

Size of Meter.	Loss in Inches.	Experimental Meters. Cubic Feet	Gain over Regular Meter. Per Cent.
3-light	0·3	83·37	111
	0·4	119·53	119
	0·5	147·70	121
5-light	0·3	140·90	109
	0·4	180·20	120
	0·5	218·60	128
10-light	0·3	245·70	151
	0·4	318·20	163
	0·5	378·20	167
20-light	0·3	386·40	162
	0·4	525·20	181
	0·5	603·60	177
30-light	0·3	568·37	186
	0·4	764·53	213
	0·5	879·60	206

Assuming that a schedule for using meters is based on a loss of 5-10ths in pressure, the 5-light size of these experimental meters will do the work of any of the present sizes from the 3-light to the 20-light inclusive; also, the 30-light size experimental meter will do the work of any of the existing sizes from the 30-light to the 100-light inclusive. [Capacity tests of the largest 100-lights now made show an average of 875 cubic feet per hour, with 5-10ths loss in pressure.] Consequently, with this loss in pressure, two sizes of the new styles (the 5-light and the 30-light) could be used to the best advantage to replace eight of the existing sizes—viz., the 3, 5, 10, 20, 30, 45, 60, and 100 light sizes.

As a striking example of the gain in capacity possible in the largest sizes, the author describes the construction of a meter to supply a 280-horse power gas-engine. The only space available for the meter was high up on a wall; and it was of great importance that it should be made as small as possible. A 500-light case size was taken; angle-iron bracing being used in the case as made. A test of the meter showed that with 3-10ths loss in pressure it passed 5250 cubic feet per hour; with 5-10ths loss, 7440 cubic feet; with 1 inch loss, 12,000 cubic feet, and then only

showing a fluctuation of 1-10th. These figures compare with an ordinary meter of 500-light capacity of 3300 cubic feet per hour, with 5-10ths loss. Encouraged by the capacity thus obtained, and in order to save further space, it was determined to experiment with a 300-light case. As the result was a capacity of 6100 cubic feet with 5-10ths loss of pressure, the 300-light size was used, and, there being nine engines, nine meters were made, and have been in use for more than a year.

The result of the author's tests of meters actually made justifies the belief that a gas company may, in future, reduce the sizes of meters installed as shown in the following table. It will be noticed that the 3-light size is abandoned. This has been done because the first cost is nearly as great as that of the 5-light, while the cost of its repair is even higher.

New Sizes.	Approximate Capacity, 5-10th Loss of Pressure.	Old Sizes Replaced.
5-light	200 cubic feet	3 to 20-light
10 ,,	375 ,,	30 ,, 45 ,,
30 ,,	875 ,,	60 ,, 100 ,,
60 ,,	1800 ,,	150 ,, 200 ,,
150 ,,	3400 ,,	300 ,, 1000 ,,

We understand that one important American company, believing that experience on an extended scale will bear out the results already obtained with a few meters, have ordered, and are now putting into use, more than 2000 of the new 5-light size, both plain and prepayment, and are making inquiry for prices of the 10-light size. Another large company are quoted as also being in the market for these meters; and if, within a year or two, none of the troubles anticipated by the manufacturers have been met with, the new design will most probably be manufactured as a standard article. The effect will be that, as the years go on, with no trouble developing from the faster speeds, the old sizes will eventually become obsolete.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Annual Meeting—Increasing the Sale of Gas.

The Third Annual General Meeting of the Association was held on Friday at the Regent Street Polytechnic—the President (Mr. Walter Grafton, F.C.S.) in the chair.

The first item on the *agenda* was the consideration of the report and balance-sheet and the election of office bearers for the ensuing year. The ballot resulted as follows: President, Mr. Grafton. Vice-Presidents, Messrs. R. H. Brown and W. Upton. Members of Council, Messrs. F. Ainsworth, R. H. Chree, O. W. Dougan, W. Dean, W. J. Liberty, and J. Clark. Auditor, Mr. W. H. Bennett. Hon. Sec. and Treasurer, Mr. P. F. Scarth.

This portion of the business having been concluded, Mr. S. A. Carpenter, of the North Middlesex Gas Company, read a lengthy paper on "Modern Methods of Increasing the Sale of Gas." The first point dealt with was the need of advertising, to let people know what facilities were being offered in the way of hiring stoves, that gas was cheaper than electricity, and that there were show-rooms where the various gas appliances could be seen. The author deprecated as seldom getting into the proper hands unaddressed circulars thrust into the letter-box, and advocated a sealed and addressed envelope, which was bound to be opened and the contents examined. The extra cost of stamping would ensure careful attention to the letters on delivery. His Company had found effective posters attached to boards at the stations (where they were seen daily by a number of City people), and also advertising in the local papers. Occasional exhibitions of stoves, accompanied by cookery lectures, did much to popularize the use of gas for culinary purposes. They were not only much appreciated by intending stove hirers, but ladies already using cookers would come to have their difficulties cleared up, and as a result would use the cookers more, and so increase the gas consumption. Again, all those who attended the lectures talked about them to their friends, who were thus reminded that there was a gas company anxious to do business. Opportunities, too, were afforded for the company's officials to get into personal touch with the consumers. His Company at their exhibitions had found the cooking of an eight-course dinner in an hour, the baking of bread, and the cooking of a breakfast of bacon, eggs, and cocoa for two in six minutes all very popular. New methods of lighting could also be advertised on these occasions. For instance, two years ago his Company entirely lit up a hall with inverted burners, which were very effective, and brought in, directly and indirectly, the lighting of three churches on this system. This year they had made a feature of the pneumatic distance lighter.

After referring to the need of doing all that is possible to persuade builders to pipe new houses, Mr. Carpenter turned to the topic of prepayment meters, which he said were very useful provided the consumers burnt a sufficient quantity of gas. The question was, however, what amount should be taken by each consumer in order to secure a profitable result. This was quite a matter of opinion, and, of course, largely varied with local conditions. Some undertakings showed an average as low as 5000 or 6000 cubic feet per annum, and appeared satisfied; others, he believed, ran up to as high as 18,000 feet a year per consumer. Where houses or flats had first to be carcassed by the company, great discretion had to be exercised before the application was accepted, or heavy losses would result. His Company always made it a practice to interview the would-be consumer, as a result of which a reliable opinion could usually be formed as to whether or not the money would be well spent in providing an installation. By careful inquiry and judicious weeding out, they had within the last two years or so been able to increase the average from 10,000 to 15,000 cubic feet. Having accepted the consumer, the next question to be decided was the apparatus and fittings he should be supplied with. His Company, if the house or flat was carcassed, provided three or four fittings and a cooker or ring; while the meter was a shilling or penny one, as desired. If the dwelling was not carcassed, they put in two lights only, arranging for them to be close together if possible—say, cooker and one light in the scullery, and one light in the kitchen. The cost did not in this way come out greatly in excess of that of a carcassed dwelling. Some undertakings, he said, insisted on all prepayment consumers taking a cooker, whether they wished to have one or not; and he knew of cases where cookers had been accepted because the applicant desired to use gas for lighting, and had stood unused for years. So long as the consumer burnt a satisfactory quantity of gas, it did not much matter how he used it. His Company charged 8½d. per 1000 cubic feet in excess of the rate to ordinary consumers, for hire of fittings, &c.; and taking the average cost of the installation as £5, and the consumption as 15,000 cubic feet per annum, this margin allowed for interest on capital at the rate of 5 per cent. per annum, and just over 5 per cent. for repairs, depreciation, and extra cost of collecting. Taken altogether, the prepayment system was a method of increasing the sale of gas which required the exercise of great care and discretion.

The letting of stoves on hire was another important factor; and his Company let out cooking and heating stoves at rentals ranging from 1s. to 3s. 6d. per quarter, in sufficient variety to meet all demands. A nominal charge of 5s. was made for fixing; the pipe being carried any reasonable distance for this sum. Every inducement should be offered to consumers to hire stoves, as these would keep the increase up in the face of competition by the electric light. About 45 per cent. of the ordinary consumers had stoves on hire from his Company; and, in addition, a large number owned them. During the last two or three years the output of stoves had been in excess of that of meters—that was to say, every new consumer had taken a stove, and some more than one. The cost of repairing stoves was a rather heavy item, owing to the fact, common to all suburban districts, that the residents were always moving; and thus a stove which would have served a tenant for some years longer had he stayed in the house, had to be removed and cleaned before it could be issued to another consumer.

As to canvassing, this, said Mr. Carpenter, was another good method of increasing the sales of gas, if properly applied. It enabled the company's representatives to get into personal contact with the consumers and explain the advantages of gas; and in this way people were reached who could not be got at by advertising, or by any other means. It was essential to get good men for this class of work—men who would speak of the merits of the stove or lamp, or whatever it might be, in such a way as to interest a consumer, and show what special benefits would accrue to him by its adoption. Show-rooms were another efficient aid. Consumers would not adopt stoves until they had seen them; while the various forms of lighting could also be exhibited in a show-room, and an effective advertisement obtained. The fittings business, apart from the profit which accrued as a direct result, was very helpful in other ways. The complaints of consumers as to insufficient supply were often found to be due to faulty burners or fittings; and if there was a fittings department, the matter could be taken in hand at once and put right—thus satisfying the consumer that the bad supply was not due to the gas. His Company had followed this course in a great many instances, and found it of great help. Again, in competition with the electric light a fittings department was invaluable. It was no use trying to persuade people to adopt gas instead of electricity for (say) shop lighting, if the company had not a lamp they could recommend for the purpose, and which they could fix and maintain in good condition.

A maintenance system did not, perhaps, bring about an increase in sales, remarked the author; but it naturally arose from the modern methods of business. For example, a gas company obtained the lighting of a public building. No one connected with the building had the special knowledge required to keep the lighting system in an efficient state; and unless the gas undertaking maintained the burners, the result would at best be but a poor advertisement for those responsible for the installation. Then to many private people the incandescent burner was a source of great worry—mantles and chimneys were always breaking, and even when the former were in good condition they complained of bad light. There were, of course, many little things connected with an incandescent burner which might be wrong, and which would escape the average householder. These could easily be put right by a good burner inspector; but if not remedied, they might cause a lot of trouble. His Company charged 9d. per burner per quarter for maintenance inclusive of mantles, and 3d. per burner per quarter exclusive of mantles; five visits a quarter being paid. For a large number of burners, and for

public buildings used occasionally, they had special rates. The mantle average for private houses was between three and four per annum; a mantle of good quality being used. Maintenance did not, of course, yield direct profit, but indirectly it was a very valuable system. Mr. Carpenter concluded his paper by calling attention to the advantages of a prompt personal visit by an official on receipt of complaints.

The discussion was opened by Mr. Scarth, who thought that the hiring out of stoves—especially heating stoves, which might perhaps only be used for a few days in the year—was rather unprofitable; the hire-purchase system seemed better, because in this way people paid for their stoves in two or three years. The employment of a good canvasser was an excellent idea; but with regard to maintenance, if the charge was only 9d., and three or four mantles per annum were required, there must be a loss. Mr. Carpenter pointed out that the charge was 9d. per burner per quarter, and three or four mantles per burner per annum were needed. Of course, there was no profit on the system. Mr. Scarth remarked that it had always been his idea that, after consumers had made complaints and the defects had been remedied, an inspector should call and ask if everything was satisfactory. This paved the way to a pleasant feeling between the consumer and the company. Mr. Ainsworth said that, with regard to exhibitions, he was quite in sympathy with the author. They ought to be often held, even where a large number of cookers were being got out. He would like to have an exhibition every year in his district, because they were necessary, not only to increase the output of stoves, but to assist people who already had them. Of course, the lectures given at exhibitions were of great assistance to the users of stoves. At present he was not too well taken with inverted burners; but there were many improvements being made, and he thought that in future this form of burner would do a great amount of good for gas. As to the piping of houses, in his district (Ilford) the Corporation were pushing their electric light business, and his experience was that builders, if all things were equal, would give electricity the first chance, if gas was supplied by a company and the electric light was furnished by the local authority. With regard to two systems of slot installations, this plan was adopted at Ilford; and it answered very well. As to making a profit on fittings, he did not think many places were doing this, because there were lots of things to do which a private fitter would not attempt, in the way of keeping work in repair. He considered 9d. per burner was a fair price for maintenance, but was afraid that in Ilford this would be more than they could get. They were now undertaking the work for 7d., for any number of burners; there being no reduction except in the case of churches and chapels. Of course, they had to lose on it; but in another way it paid very well. Had it not been for the maintenance system, the Company would have lost a far greater number of consumers than they had done from the competition of the electric light. There should be a rent charged for cookers, because otherwise people would have them in and use them just once now and again. When cookers were returned, his Company made a refixing charge, as people used to send them back for the winter to save the rent.

Mr. Warren thought that gas companies would not lose a very great deal if they made no charge for either prepayment or ordinary meters; while as to fittings, companies should be content with little or no profit. The maintenance system was not carried far enough. If the man who went to look after the burners also attended to the gas-stoves, it would be a great benefit. Mr. Liberty, with reference to the two systems of slots which Mr. Ainsworth had referred to, asked whether he gave two burners more where the houses were already piped than in cases where there were no fittings in. Mr. Ainsworth said they charged at Ilford 5d. extra per 1000 cubic feet where the fittings belonged to the consumer, and 10d. where they were the property of the Gas Company. Where the house was carcassed, they gave five fittings and a cooker or ring; and where there was already no piping, they supplied three burners and a cooker or ring. Mr. Liberty remarked that in this case, a prepayment customer with a house already piped was a person to be sought after, because, although he was only charged 5d. per 1000 feet extra instead of 10d., the additional two burners supplied made him use more gas. Mr. Winslow said he thought companies ought to use shilling meters, rather than penny ones, as much as possible, because of the saving in cost of collection. As to maintenance, this should pay for itself; if there was a loss in the maintenance department, it had to come out of the general funds. Such a charge as 7d. per quarter placed adjacent companies in an awkward position if their price happened to be more. One company perhaps could afford to take the loss on maintenance out of the revenue, while another could not do so without raising the price of gas. For pushing cookers, he thought a lady canvasser was essential. Cookery lectures were, of course, very good; but he should also advocate the retention of a lady at (say) the show-rooms, ready for consumers to write and apply for advice at home regarding their cookers. A fittings department was very valuable; but it should be run on sound business lines, and be made to pay. Mr. Portass said none of the speakers seemed to have dealt particularly with the question of whether gas companies should compete with tradesmen for the fittings business. In his town, they seemed to get along with them very well indeed; but this, he might say, was not always so.

The President said a low price would do a great deal towards more gas being used. Their object should be to introduce economies, and so save grumbling at gas bills. To pacify the consumer, he should be shown the best way to burn gas. When the price was reduced, the consumer was less careful with regard to the quantity of gas he used; and he (the President) was convinced in his own mind that if the charge was (say) 2s. instead of 3s., the consumer's bills would be the same or more, because he would not take the same precautions. This applied not only to large but to small consumers. The 8½d. mentioned by Mr. Carpenter seemed to him a fair additional charge for prepayment consumers, in view of the maximum of 10d. per 1000 cubic feet; but he knew of one company who charged only 3½d. extra. As to meter-rents, if these were not charged, the price of gas was affected. Many meters were used as a stand-by where electric light was installed; and why should they not be paid for? Mr. Liberty here pointed out that the Gaslight and Coke Company did not charge meter-rent; and this made a difference of about ¾d. per 1000 cubic feet. The President (continuing) said he had had some inverted burners in use for over twelve months, and had not yet replaced the mantles. Of course, they were not in continual use. If these burners were regulated as regarded consumption, they would obtain a very good result.

In replying to the discussion, Mr. Carpenter said he was afraid that if the letting out of stoves was confined to the hire-purchase system, there would be fewer consumers who would go in for them. So long as the rent covered cost of repairs and interest on capital, this was all that was required. As to the repair of heating stoves, this item came out very low; there being little to get out of order. The average of between three and four mantles per annum on the maintenance system included shops and private lighting. Where a consumer was on the maintenance system, he was not so careful how he treated the mantles. A maintenance system was, however, necessary if they wished to increase their business. In all cases where his Company had churches or public buildings lighted with inverted burners, they paid regular weekly visits. With regard to the local gas-fitter, he did not think he was a great friend of the gas company. Generally, he put in a lot of cheap work; and companies could not afford to look at the matter from a sentimental point of view. As to two systems for slot installations, people who had their own fittings might have a slot meter, if they wished it, set at the current rate. Of course, if the Company put in an installation, they must charge the slot consumer something additional to cover capital cost. The suggestion that maintenance should be extended to the upkeep of stoves was a good one, as also was the proposal to employ a lady canvasser. A man did not know much about cooking; whereas a lady was able to deal with all the special difficulties and points that arose. Mr. Ainsworth here remarked that it would be the greatest mistake that could be made to put maintenance men to look after stoves as well. They must have a check on the work done; and any amount of time could be spent attending to cookers.

On the motion of the President, seconded by Mr. Brown, a hearty vote of thanks was passed to Mr. Carpenter; and a similar compliment was accorded to the President and Hon. Secretary (Mr. Scarth), on the proposition of Mr. Ainsworth, seconded by Mr. Liberty, for their work on behalf of the Association.

GAS ASSOCIATIONS IN AMERICA.

The Consolidation Question.

At the recent Annual Meeting of the Western Gas Association, the following remarks on this subject were made by the President (Mr. O. O. Thwing) in the course of his address.

At the Congress of Gas Associations of America at St. Louis, in June, 1904, a plan was adopted for the constitution of a Committee to formulate a scheme for a single Gas Association composed of the men engaged in the gas industry in North America. This Committee was to be composed of two representatives from each of the Associations then in existence and of three delegates at large.

The tendency of the times is towards consolidation, or rather combination and organization, of allied interests; and there is no doubt that, if a satisfactory plan can be evolved, much benefit would be derived from an organization of our Gas Associations under one directing Board or Committee. By means of such an organization, matters of large importance, and questions of much complexity, could be taken up by the head organization, whether called "Board," "Committee," or "Association," and followed to an intelligent and definite conclusion; leaving the practical and local questions to the consideration of the individual Associations. There is no question that sustained and continued study of problems of importance has not been the practice in any of our Associations, but that members have been encouraged to write "as the spirit moved them," and generally upon any subject they cared to select. In consequence, cumulative research has not been the rule, except where an individual member has been sufficiently interested to undertake it.

A general supervision by a competent Board of the work of all of our Gas Associations would certainly be beneficial both to them and to the fraternity at large; but to overthrow and annihilate the older Associations and substitute in their places a single new one, is, in my opinion, extremely unwise and undesirable.

For our Gas Associations are more than mere vehicles for formal discussion and investigation of topics of interest presented to them as societies. Their annual meetings are opportunities for reunions of old friendships and the beginning of new ones, among as broad-minded and capable a lot of men as ever associated together in the same line of business. I regard the personal interchange of thought, experience, and opinion, which does not appear in the printed proceedings, as being of more value to the members individually than any part of the programme. There the young and inexperienced superintendent, who is puzzled over some course of procedure or worried over some condition, will meet those who are competent to advise him, and who will cheerfully do so. There the older and experienced man replenishes his fund of knowledge and learning from that of the enthusiastic younger one, fresh from the schools, and full of new methods, theories, and discoveries. This feeling of fraternity and fellowship, of mutual esteem and willingness to assist, is especially noticeable in the Western Gas Association; and let us hope it will remain a feature of the Association for ever.

In looking over the records of the Western Gas Association, I find, among the proceedings of 1887, a paper prepared by Mr. Frederick Egner, on "An American Gas Institute." The discussion following this paper reveals the fact that, for several years previous to 1887, both the American and the Western Associations had been endeavouring to form an Association or Board representing all the Gas Associations and all the Gas Companies in the country, and supported in much the same manner as the proposed single Gas Association is to be supported by the scheme of organization submitted at the Gas Congress. The objects of the Association, Board, Institute, or what you will, were practically the same as those given as a reason for the consolidation of Gas Associations—viz., for mutual aid against unfair competition and unjust legislation; to gather and disseminate general information regarding matters concerning or relating to the industry; to more especially exert a watchful eye over the field of invention; to investigate, and, if possible, try, all alleged improvements, reporting freely on their value; and to carry on general research and investigation for the benefit of the gas industry. It seems that all efforts to accomplish any undertaking of this kind had died of inanition, due to the indifference of those who were expected to aid the plan financially; and the Committee appointed to again take up the plan, as advocated by Mr. Egner in his paper, was compelled to report failure at the next meeting of this Association for the same reason.

In view of the doubtful prospects of the formation of a single Gas Association in the near future from those now in existence, I would recommend that the Western Association again take up the consideration of a Gas Institute; and having shown during the past year that it was capable of carrying out alone a gas exhibit at a World's Fair, in spite of former failures, I have no doubt that something tangible is bound to result. There is no reason why the preliminary work on a project of this kind should not be undertaken by one body, put into definite shape as far as possible, and then submitted to the other Associations for criticism, amendment, and finally co-operation.

At the last meeting of the Ohio Gaslight Association, it was decided to defer the location and time of the next meeting of that Association, pending a proposition to the Western Association for the holding of a joint convention in May, 1906, with the object in view of a permanent consolidation of the two Associations. The proposition is one of grave importance to the two Associations, and I hope no hasty action will be taken in the matter. If there is any prospect of action on the proposed organization of American Associations in the near future, I cannot see any reason for previous consolidation of any two or more existing Associations pending such action. It would be best for them to preserve their integrity as distinct Associations, in order that their individual influence may be felt when the scheme of consolidation is reported.

A Gas Association for Iowa.

At the same meeting, it was decided to form a State organization for Iowa; and the following temporary officers were elected:

President.—Mr. L. L. Kellogg, of Sioux City.
Vice-President.—Mr. G. M'Lean, of Dubuque.
Secretary and Treasurer.—Mr. F. W. Kelly, of Davenport.
Executive Committee.—Mr. Jansen Haines (Chairman), of Des Moines; Mr. G. S. Carson, of Iowa City; and Mr. A. T. Averell, of Cedar Rapids.

A Committee of Organization was appointed, and the first meeting of the Association will probably be held in Des Moines some time next September.

English Gas and Water Companies Abroad.—In recent numbers of the "Pall Mall Gazette," attention has been called to the steady and improving character of gas and water undertakings abroad which are in the hands of English companies. Nine gas companies are tabulated, and in every case but one they yield 5 per cent. and upwards, and the shares are higher in value than they were a year ago. The water companies (five in number) show even greater progress—three having paid increased dividends for 1904 compared with 1903, and only one had a slightly reduced profit.

WOOD GAS FOR POWER PURPOSES.

Mr. Dugald Clerk on Suction Producer Plants.

In the "JOURNAL" for Jan. 12, 1904, we gave a description of the plant in use at the works of the Moctezuma Copper Company, at Nacozari, Sonora, Mexico, for producing the gas for driving the Crossley engines which furnish the power. The producers employed are the Loomis-Pettibone, which have been on several occasions described in our columns. In considering the question of the raw material to be employed, it was decided to utilize as far as possible the local supply of wood; and in the article above referred to some particulars were given of the trials carried out. The subject was brought before the Iron and Steel Institute three years ago by Dr. James Douglas, of New York; and some further information was furnished by Mr. John Langton, of that city, in a paper read by him before the American Institute of Mining Engineers in October, 1903. It was from this paper that the particulars contained in our article were obtained. Since they appeared, interest has been revived in the matter by the reading of a paper on the subject, by Mr. G. M. Douglas, at the last meeting of the Institution of Mining and Metallurgy.

The wood fuel employed consists mostly of an inferior scrubby oak. A little "mesquite" is used, and another species of oak locally called "black" oak. This latter is the best. It is supplied from neighbouring hills, and is brought to the plant in 3 ft. 6 in. lengths, which are sawn in two. In starting and operating this plant with such wood for fuel, the method that four years' experience has shown to be best is as follows: Coke is put on the grates of the generators to a depth of 3 feet to 3 ft. 6 in. Less than 3 feet is not advisable when making gas from wood; otherwise volatile products of distillation from the fuel may pass through unfixed, and by condensing to soot or tar may result in waste and cause trouble by dirt. Small and light wood, tops of trees, branches, &c., should be put on coke to a depth of about 3 feet, and the blower started. A handful of lighted oil waste thrown on top of the wood will start fires. The light wood is enough to make a coke bed incandescent, and usually requires about an hour. As soon as this is seen to be the case, fast feeding with heavy wood is necessary. The heavy lumps which are objectionable when fires become older are well saved for this purpose. The fires should be kept at a low temperature, which may be regulated by the speed of feeding. Only enough combustion is required to transform the wood into charcoal. When a bed of this incandescent charcoal and partly-consumed wood is formed to a depth of a couple of feet above the coke bed, the fires are ready for supplying gas to the engines. The valve to the suction of the exhauster should be opened, the fan stopped, and its suction valve closed. This preliminary operation usually requires from four to five hours, and from 3½ to 4 tons of wood.

Burning wood at the rate of 30,000 lbs. per diem, the ash accumulates, so that by the fifth day's run on one set of plant it is necessary to shut down to clean—a change being made to the other set. For the first 36 hours, the fires should be allowed to rise—*i.e.*, more wood should be put in than is consumed to ash. This becomes charcoal, and adds steadiness to the value of the gas. There is no ultimate loss—all fuel in the generators being recovered before shutting down to clean. The wood should not be longer than 2 feet. Heavy pieces are very objectionable, and should be split. The fire should be fed steadily, and with a little fuel at a time. The judicious use of different sizes of wood must be made by attendants to keep the surface of the fires level and ensure the even passage of gases through them.

The following is a sample that may be taken as an average of the composition and calorific value of this wood gas:—

CO	13·45	CO_2	15·45
H	19·50	O	0·25
CH_4	2·48	N	48·50
C_nH_{2n}	0·37	B.T.U. per foot	135·60

No trouble is experienced with pre-ignition, though the proportion of hydrogen in wood gas occasionally runs up to 23 per cent., and the compression of the engines is as high as 90 lbs., with pistons uncooled by water.

A trial was made on one set of generators for a run, in which the greatest care was taken to ensure accurate figures. Fires were lighted in the set of generators, and the trial was made at 9.30 a.m. on Dec. 26, 1904. At 3 p.m. they were ready to run on, and the old fires were discontinued altogether at 7 p.m. At 2 p.m. on Dec. 31, after four days' 23 hours' run, a change was made again, and the trial completed. The following are the results:—

Coke put into generators	8,590 lbs.
Wood used for firing up	7,400 ,,
Duration of run	119 hours.
Ash taken from generators	14,124 lbs.
Coke recovered	2,572 ,,
Total amount of wood used	138,840 ,,
,, ,, coke used	5,918 ,,
,, ,, combustible used	144,758 ,,
Water in wood	19·8 p. ct.
Ash in wood	10·3 ,,
Calorific value of gas B.T.U. actual (average of 35 tests)	116·4
Total output of power house =	39,700 kw. hours. / 53,217 hp. ,,
Average power =	447·2 electric hp.
Consumption per electric horse-power-hour	2·6 lbs. wood. / 0·11 ,, coke.

The author concluded by saying that a general statement as to whether or not the kind of power described was advantageous could not be made, as it would depend upon the purpose for which it was required, the price of fuel, and other matters. Speaking roughly, the great advantage of the gas-engine plant lay in its extreme economy of fuel; for in nearly every other respect it was at a disadvantage compared with steam.

In the course of the discussion upon the paper, Mr. Dugald Clerk said he could not help thinking that no engineer should attempt to work gas-engines with gas made from wood if he could get anything else. The paper was really a most interesting one, because it contained the fullest account—in fact, the only full account—of the difficulties of working with wood in producing gas. The author had apparently been a little prejudiced against gas-engines because of his unfortunate experience with wood. He noticed that, working with the producer described in the paper, it took about five hours' operation, and the burning of about 3¼ to 4 tons of wood, before the producer was in order to give gas at all. Then after it had been operating for five days, they had to burn out all the carbon, switch on another producer to keep the gas going, and then start afresh. At the same time, in order to keep the wood producer going, they seemed to have to blow in pure steam, every four or five hours, in the reverse order of the gas production. In the wood-gas producer, the gas was generated by the down-draught system—that was to say, the air to decompose the wood passed in at the top and then went down through a mass of incandescent fuel, and the gas was taken down below. This was exactly the reverse process to that used in this and other countries so largely for the ordinary production of gas. There was a very good reason for it—viz., that wood contained so much volatile matter that unless it was carried through a mass of incandescent fuel one would have a great many only partly fixed hydrocarbons, and these would deposit and produce great masses of tar. But even with the reverse method of operation, there seemed to be considerable difficulty, because the scrubbing plant was rather elaborate. He thought the experiment was an extremely creditable one; and the fact that they could do the consumption mentioned with about 2½ lbs. of wood and 0·11 lb. of coke per horse-power-hour, showed that the plant must have been worked with extreme care. At the same time, the difficulty of operating such a plant was very great. He could quite understand that skilled labour was highly necessary.

Mr. Clerk passed on to contrast the plant described in the paper with the suction producer plant which is now being extensively employed in this country; and he stated that, up to certain powers, it was proving a very dangerous competitor of coal gas, the cost being so low. For a long time, he said, there had been producers operating on the pressure principle; but they required not only a producer and a scrubber, but a gasholder and a steam-boiler, and consequently a great deal of attention was necessary. But the peculiarity of the suction plant was that one could start a 40-horse power engine within ten minutes, fill up the producer with fuel, and leave it practically all day without looking at it. One did not require, even if the engine was working at full load, to put on fuel more than twice a day; but in ordinary circumstances the engine would work without attention with the producer in operation, without anyone troubling about it in any way, just like a coal-gas engine. He had had occasion last year to make a rather elaborate test of one of the most recent of these producers, with a Dowson plant, at Basingstoke, and from the test he found that, if one assumed 100 heat units to be capable of being generated by the anthracite used, the engine was receiving, in the form of gas ready for combustion, about 89 per cent. of all the heat contained in the original coal. In other words, if the coal had been burnt direct with carbonic acid and water, one would have got 100; but by putting it in the producer one got to the engine some 86 to 89 per cent., depending on the size and the load on the engine. This was an efficiency far greater than was found in the steam-boiler. He had pressed upon the gas companies the desirability of supplying coal gas at 1s. and 1s. 6d. per 1000 cubic feet; and he thought a good many of them were going to do so for motive purposes. Mr. Clerk showed a photograph of the largest installation of gas-engines at present in Great Britain, which he said were worked with waste gas from blast-furnaces. It was an enormous source of power which had not yet been utilized. There was in this country going to waste something over 1½ million horse power in blast-furnace gas, which could be used for power purposes.

Mr. Alfred James remarked that Mr. Clerk's rather strong condemnation of the practice of using wood fuel for power-gas purposes might arise from the fact that they had not yet succeeded in solving the problem of economically working the fuel. In Australia, they claimed to have overcome the difficulty experienced on this side. They said that, whereas with the plant here the engines were all stuck up with bituminous products, they used those very products and converted them into gas, and they were the cause of the high efficiency attained. Mr. R. E. Commans asked Mr. Clerk to what limit the suction of the gas-producer could be safely carried without materially altering the mixture which went to the gas-engine. Mr. Clerk replied that, in an ordinary suction producer, if one went below quarter load the area of incandescent fuel was so much reduced that the quality of the gas did fall off somewhat; but most engines which were intended to run at very light loads were so arranged that whenever a load came down to one-quarter, the igniter was so altered as to ignite a little forward, so that the consumption should never fail. If one went below a quarter load, there was danger. The President (Mr. W. Frecheville), in closing the discussion, remarked that members were constantly confronted with the problem of using a very inferior fuel; and therefore such papers as the present would always be of interest.

Votes of thanks were passed to the author, and also to Mr. Dugald Clerk for his contribution to the discussion.

INSTALLATION AND CARE OF GAS-EXHAUSTERS.

By E. D. Johnston.

[A Paper read before the Ohio Gaslight Association.]

The installation and care of gas-exhausters is a matter, judging from experience, that does not receive the best attention in all gas-works. By first properly installing the exhauster and then giving a few minutes each day to its care, a large amount of expense and trouble can be obviated.

In installing the machine, a solid masonry or concrete foundation is always preferable, even for the smaller sizes. The depth of the foundation will depend upon the weight of the exhauster and the character of the ground where the installation is to be made. If, for any reason, it is necessary to place the exhauster and engine higher than the ordinary surface of the ground, then, in such a case, if it is at all possible, the foundation should be built to the required height; but if this is impracticable, the superstructure should be of steel, well braced to the walls of the exhauster-room. I have seen medium-sized exhausters and engines installed on an ordinary floor with a cellar beneath it, and without any extra bracing under the floor to prevent vibration. In other cases the exhausters have been placed on heavy timbers, which were set in the ground; and it was only a matter of a comparatively short time before new foundations would have to be provided. The best is always the cheapest when it comes to the matter of foundations. The first essential in installing an exhauster is to get it perfectly level both ways. The operating parts are fitted so closely in the case of the exhauster that if it is placed in the slightest twist in being installed, the parts will bind.

One of the most common causes of trouble in setting an exhauster is in connecting the inlet and outlet pipes. Very frequently, when the flanges of the pipe connection do not come square with those of the pipe plates of the exhausters, the man in charge of the work will draw the flanges together with the bolts; thus springing the case of the exhauster to such an extent as to cause knocking or a binding of the operating parts. Care should always be taken, in making these connections, to have the flanges of both exhauster and pipes perfectly square with each other, and to be sure that the weight of the pipe connections does not come upon the exhauster.

As a usual thing, when an exhauster with side inlets and outlets is being connected, the pipes run down under the floor or ground, vertically, and elbow into the system of piping about the works. In order to prevent the weight of the pipe connections coming on the exhauster, the best plan would be to have an iron foot cast on the elbow connecting the vertical pipe from and to the exhauster and the horizontal pipes in the ground. This foot, resting on a pier of masonry or concrete, will take the weight of the vertical section of the pipe; and by the use of shims under this foot the flange of the elbow at the exhauster can be brought to the exact height, and this elbow can be turned so that a perfectly square joint is made. If it is found that the piers upon which these feet rest settle, then shims can be resorted to again to remove the strain caused by the weight of the connections.

Another cause of trouble (which is not always so apparent) is the thrust of the crank-shaft of the engine, which will cause heating on one or other end of the exhauster. Sometimes the end-heating is caused by the machine not being set perfectly level. But the trouble can usually be detected, and the cause located, by taking out the bolts of the coupling. If there is any faulty alignment, the coupling flanges will indicate the trouble by their position with relation to each other. If there is a twist in the bed-plate, the flanges will show the direction of the trouble, and the bed-plate can be adjusted until the coupling flanges come square and flush with each other. The exhauster is then in line, and there will be no binding of the operating parts by reason of misalignment. If, however, when the coupling bolts are taken out the flanges remain practically flush all round, and bind each other or spring away, this is due to the thrust of the engine-shaft, which is caused by wear in the engine bearings, or the natural operation of the engine, which usually thrusts its shaft one way or the other while in motion. If the exhauster impellers bind on the end farthest from the engine, the coupling flanges will bind when the bolts are out. The remedy is to bump the engine with a short piece of timber, away from the exhauster, until the amount of the thrust is overcome, re-ream the dowel holes, and drive in the dowels. The heating will then disappear. If the impellers bind on the end nearest the engine, the coupling flanges spring apart when the bolts are removed. The remedy is to bump the engine towards the exhauster until the coupling flanges meet, secure the engine to the base as just described, and the heating

will disappear. Nine times out of ten, one of these suggestions will apply to troubles experienced in installing an exhauster.

When once the exhauster and engine are thoroughly well installed and adjusted for regular work, their care should be an easy task. There are three cardinal points to observe in caring for an exhauster: (1) Keep all the accessible parts of the exhauster, engine, and governor clean and free from superfluous oil, tar, and dirt; (2) by daily observation see that all adjustments are kept up, both as to the setting of the machine and as to the adjustable parts; and (3) see that all parts requiring lubrication are never neglected. Oiling should also be a matter of daily care and attention. Where the self-oiling arrangement is used in the journal box, it is only necessary to remove the oil from the reservoir every three or four months and return it for additional service, with now and then a little fresh oil from an ordinary can. Another important point in the care of an exhauster is to keep the gears well lubricated with a very heavy oil, or, what is better, a mixture of plumbago and a good quality of grease. This reduces the wear of the gears to the minimum.

Special attention should be given to the care of the stuffing-boxes. I am of opinion that more trouble is experienced after the installation of an exhauster on account of inattention to these than from any other cause. If the packing is neglected, it will not be long before the tar and ammonia work out and get into the bearing. This is, of course, destructive both to the journal and to the bearing. Gross negligence of exhausters is displayed in allowing the packing to work loose to such an extent that tar and grease become caked all over the end of the machine. It is apparent at once that such neglect is ruinous to a machine which is of the utmost importance to the successful operation of gas-works. I have seen machines that have come back to our works * for overhauling where the tar has not only worked into the journal-box and almost destroyed it, but has also worked over into the gear housing. This can all be avoided by simply renewing the packing as often as practice teaches that it should be done to keep the machine absolutely clean. Square flax packing is probably as good as any that can be secured. It sometimes happens than an exhauster remains idle for a short period, and difficulty is experienced in starting it on account of the tar having become hard. This is overcome by introducing benzine or coal-oil through the sight-feed oilers placed at the top of the case. By this means the tar is softened and cut, and the exhauster can then again be operated.

The exhauster should always be placed in a room where there is plenty of light, so that all the adjustments can be properly watched. Care should be taken to have the exhauster so that there should be ample space about the machine to admit of getting at all the parts without trouble; for if its location is such as to make the care of it troublesome, some of the above points will probably be neglected.

In the course of the remarks upon the paper,

Mr. C. G. Atwater (New York City) said he had had some trouble with a plant for long-distance gas transmission in which two exhausters coupled to a single shaft were driven by an engine belted to a pulley between them. These exhausters regularly stuck if they were shut down for an hour or longer, and had to be loosened before they would start. The makers examined them, but did not overcome the trouble. He tried steaming them before starting, so as to soften any tar that might have hardened on the paddles, and also used kerosene oil to cut the tar out. He also slackened the side-plate bolts to give the paddles more end play, and even put a thin gasket in them. One of these methods, or all of them, succeeded after a while. There was no tar to be found in the gas by the ordinary tests, and the only condensate in the pressure line was oil or water.

The President (Mr. F. W. Stone) remarked that he had seen exhausters which, after having been installed for some time, occasionally pounded or knocked inside, without apparently any reason for it. He asked the author what was the cause of this, and what would be the remedy. Mr. Johnston replied that it was hard to say what the cause was. A deposit which would gradually accumulate and harden might produce such an effect; but otherwise he could not imagine what would cause an exhauster to knock occasionally without any apparent reason. Mr. Hicks said the trouble referred to arose sometimes when the adjustments were worn down a little and the impellers were very close to the bottom of the case. Another cause for it, as Mr. Johnston had said, was accumulation of dirt. And there was a further one—temperature, an excess of which might cause binding and produce knocking. He thought an exhauster running under variable conditions as to temperature, &c., should be built a little more open; and if this were done, he thought the difficulty would be overcome. Mr. Atwater said he had seen an exhauster, of the vertical type, pushed out of its position, and made to knock seriously, by the expansion of the connections due to the difference between summer and winter temperature. Mr. Whysall suggested the use of steam-turbines instead of reciprocating engines for driving exhausters. Mr. Klumpp, however, expressed the opinion that the present positive exhauster ran much too slowly to allow of a satisfactory reduction of the turbine speed to permit of this machine being adopted, especially in the case of small turbines.

* The P. H & F. M. Roots Company, of Connersville (Ind.), of which Mr. Johnston is the President and General Manager.

Mr. Schwarm said in one plant in a town of 5000 inhabitants with which he was acquainted, the exhauster was driven by a water motor operated by pressure from the city mains; and it cost from $90 to $100 a year. It was the most satisfactory power he had ever seen for driving an exhauster, which was a 6-inch one passing from 1000 to 2000 cubic feet of gas per hour.

The next remarks bore upon the subject of the care of exhausters. Mr. Osbourne said he had an exhauster in which the packing remained for nine years; but Mr. Johnston said he would never advise anyone to allow this to occur. The packing was bound to get hard, and it ought to be renewed, whether the tar got into the box or not, probably every three months at the very least. Mr. Osbourne said the reason he made the statement was because the writer of the paper spoke about the matter as one that should have special care. The exhauster to which he referred had been running 24 hours a day for twelve years. However, the conditions were very favourable. The gases were always at the same, or practically the same, temperature. Mr. Clapp thought the number of years any machine would run would depend largely upon the revolutions. His experience had been that it was better and cheaper to keep exhausters as nearly new as possible. Attention had been called to the fact that the men about the machines did not know how to take care of them. He thought it was less ignorance than carelessness. If the person who had charge—the superintendent or manager—would speak to the men occasionally, more attention would be given. To have a specified time for repacking or readjustment might be practicable in some gas-works, but not in a large number. Mr. Osbourne said the exhauster he had mentioned had had the personal care of the engineer, and it was looked after by a man who knew how to do it. Mr. Hicks remarked that the only way to get long life in packing was to keep it soft and pliable, either by laying it at the start in graphite or in oil, or by having it oiled (say) every two weeks to keep it soft. In this way, they could double and treble the life of ordinary flax packing.

A DUST-PROOF RESPIRATOR WANTED.

It may be remembered that rather more than two years ago the Council of the Society of Arts announced that they were prepared to award, under the terms of the Benjamin Shaw Trust, a prize of a gold medal (or £20) for the best dust-arresting respirator for use in dusty processes and in dangerous trades. The matter was referred to a Committee with Sir W. Abney, K.C.B., as Chairman; and they have now issued their report. Altogether 60 applications were sent in by the date named—Dec. 31, 1903; the largest number (27) being from places in the United Kingdom. Some of the competitors sent in apparatus, others drawings, and others again merely descriptions. The Committee laid down the following conditions: (1) It must be light and simple in construction. (2) It should be inexpensive, so as to admit of frequent renewal of the filtering medium or of the respirator as a whole; or, alternatively, it should be of such construction that it can be readily cleaned. (3) It should not allow any air to enter by the nostrils or mouth except through the filtering medium. (4) It should not permit expired air to be breathed again. (5) The filtering medium, though it should be effective in arresting dust particles, should not offer such resistance as to impede respiration when worn for some hours under the actual conditions of work. (6) It is desirable that it should be as little unsightly as possible. After a careful examination of the various specimens sent in, the Committee found that they could be arranged under the following heads: (A) Respirators fitted with a valve. (B) Arrangements for supplying air from a distance. (C) Respirators of the nose-bag type, consisting of a pad of woven or fibrous material, sponge, &c., with or without a supporting frame. (D) Casing with adhesive material to retain dust. (E) Mouth and nose plugs, or arrangements to be held in the mouth. (F) Devices in which the dust was arrested by centrifugal action during its passage through spiral or convoluted tubes. (G) Miscellaneous, including an ozonizer, a frame fitted with electro-magnets, and an arrangement for keeping the dust from the mouth by means of a current of air blowing across the face.

It appeared to the Committee that all the apparatus of practical value was included in classes A and C. Many of these showed very great ingenuity, and a considerable number of them would certainly be effective in preventing the access of dust to the lungs. In most, however, the air passages were certainly insufficient, and their use in practice would, without doubt, be extremely exhausting to the wearer. There were, however, a smaller proportion of the appliances which were not so liable to this defect; but it did not appear to the Committee that any of them could be worn during continuous labour without grave inconvenience to the worker. On the whole, therefore, they came to the conclusion that in none of the apparatus sent in was there sufficient originality to justify the award of a prize. At the same time they thought they were justified in mentioning certain makers as having submitted appliances either of considerable practical use, or containing sufficiently novel suggestions to make them worthy of consideration. Among these was one submitted by Mr. G. F. Zimmer, of Mark Lane. It consists of a nosebag of india-rubber sheeting, with a celluloid cell in front filled with sponge. An india-rubber flap, which seemed to the Committee

unnecessary, had been attached on the inside; and a diaphragm ran across the centre, intended to force the workmen to inhale through the mouth and exhale through the nose. The Committee thought it was rather difficult to understand the use of this.

In concluding their report, the Committee say that though they regret their inability to recommend the award of a prize, they trust their labours may not be without a little value as indicating what is required, and demonstrating that the requirements they originally laid down yet remain unfulfilled. They still recommend the problem to inventors. They point out that what is wanted is an apparatus that will "arrest dust, and can be worn by a man while doing hard work, such as turning a lathe, without causing him to pant." It must also be cool and convenient, and have sufficiently large air-passages.

INVERTED GAS-BURNERS.

An Anti-Vibratory Device and Globe Support.

Inverted incandescent gas-burners have now become so popular on account of their ornamental appearance, useful downward light, and good efficiency (when properly adjusted), that it is a natural thing that inventors should turn their attention to improving upon the auxiliary parts or fittings of the burner, and to adapt it to all conditions in which light is required. We have seen the inverted burner so developed from the stage at which one was almost afraid to look at it lest it should light-back or begin humming or jumping about in a most irresponsible manner to a point at which an absolutely and highly efficient light was obtained for all indoor purposes. Then from that there came its encasing in a form that made the light suitable for shop or factory purposes, or for use in draughty places; and only recently there has been seen an example of an inverted cluster-burner lamp that is intended for the lighting of tramway routes. So that the application of the system is growing apace.

Messrs. W. Anderson and Co., of Edinburgh, have now submitted for inspection a burner (of the New Inverted Company's pattern) with which they have associated, in a very neat and ingenious fashion, an anti-vibratory device and a new method of supporting the globe (fig. 1.) There are many places where it has been proved that anti-vibratory arrangements are an absolute necessity for the fair preservation of mantles; and it is in these places that this burner of Messrs. Anderson and Co. can with advantage be applied. While such anti-vibratory devices are not essential in all situations, the globe-supporting arrangement the patentees have devised is at once so simple and so effective that its general application to such burners would not, we think, be unwelcome by consumers. There is nothing more irritating than, in cleaning a large number of inverted burners, to have, before a single globe can be released, to partly remove three thumbscrews; and before the globe is again safely replaced to have to twist the three screws home again. Even such a simple operation as that involves danger. Many a globe has met destruction while being removed or replaced; and not a few have arrived at the end of their service, through the supporting screws being turned so tightly that no allowance has been made for expansion. In the gallery of this burner, Messrs. Anderson and Co., have fixed a simple wire-spring clip, the ends of which are furnished with two little knobs protruding through slots in the gallery (fig. 2). By pressing the knobs by the thumb and finger almost close together, the spring is opened and the globe is at once inserted or released as the case may be. The wire is sufficiently resilient to cause it to immediately return to its normal diameter on the knobs being released, or if the globe is placed in position to encircle the groove at the top securely, and yet giving ample play for expansion. Not only is this method of support convenient, but it ensures the globe always being suspended quite centrally. If there is one drawback, it is in the "fatal facility" which the arrangement gives for meddling fingers to release the globe, and thus in all likelihood bringing it to grief. But we cannot have advantages all ways without some little inconvenience to discount them.

FIG. 1.

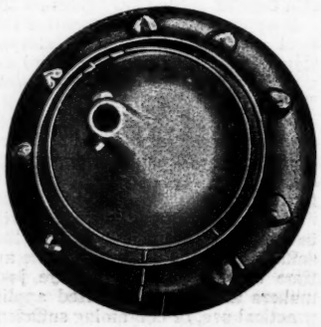


FIG. 2.

The second feature, however, is the more important—that is, the arrangement for reducing the vibration of the mantles. To secure this, the upper and lower parts of the burner are made separate, and have no connection other than is furnished by the cylindrical casing round the upper part of the bunsen tube and its contained spring, from which the whole of the burner below that depends. If fig. 3 is followed, the construction will be readily appreciated. E is the gas-nipple, around which is the portion of the casing containing the air-inlet holes, which are in turn provided with a collar for regulation purposes. From this extends the bunsen tube F, which runs into the well-known porcelain coned tube of the New Inverted Company's burner. At the top of the bunsen tube is a cap G, which screws on to the outer casing A, on an inner flange at the bottom of which rests a spiral spring C. The inner cylinder B, forming the head of the lower part of the burner, has at the top a flange protruding outwards, and this it is seen rests on top of the spiral spring.

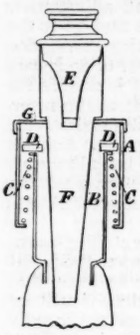


FIG. 3.

These constitute the very simple means by which the antivibratory device is enclosed within the burner. Air is prevented from getting into the burner between the case and the cylinder by a metal disc D, which fits loosely on the top of the cylinder, and allows perfect freedom to the bunsen tube. The arrangement is very sensitive indeed to the slightest vibration. The objection is made to the use of anti-vibrators with ordinary burners that they result in an increased wearing effect on the bottom parts of the mantles surrounding and coming in contact with the burner-heads. But in the case of the inverted burner, with its mantle suspended on a steatite ring, this objection cannot apply. The whole arrangement has a neat and well-finished appearance.

REGISTER OF PATENTS.

Gas-Purifiers.—Hodge, J., of Lostwithiel. No. 8492; April 13, 1904.

The patentee states that the object he had in view in his invention was "to purify gas with a thicker body of oxide and to decrease the back pressure, increase the effective working capacity of the purifier, the purifier to be discharged and reloaded without turning the purifier out of action, less ground-space required, no men required to enter the purifier, the purifier can be worked from outside by hand or power."

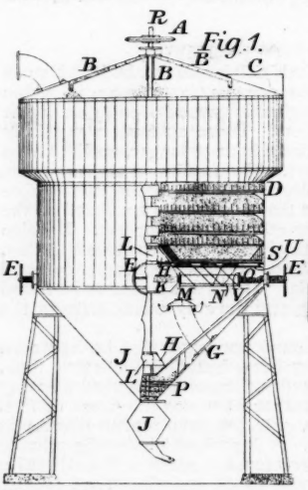
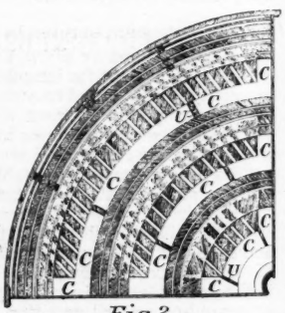


Fig. 1.


C
C
C

with levers outside the purifier; and H are revolving shields on the shaft R, to cover the socket L. This socket is carried from the end of the grids up underneath the shield H (in a groove not shown) so as to keep the oxide from getting to the shaft R. K is a centre block into which the tube or solid bar O (screwed both ends) is to work into, N is a steel tube fitted over the tube or bar O with a backnut arrangement on the tube and faced to the tube so as to keep the outside tube in one position. Thus when the tube O is entering the block K, it will take with it the outside tube N, and at the same time open or shut the grids. G is the inlet for the gas; J are the receivers; A is a cog wheel or operating wheel; M is a hood to cover the inlet pipe; V are backnuts; and S are bottom scrapers to work over the face of the grids. C (in fig. 3) are open spaces for the oxide to be discharged into the receivers. The gas-ways shown in fig. 2 are fitted with a fork-like arrangement—one in each gas-way, and fastened to the face of the stationary parts of the grids so that when the grids are open or shut they keep the gas-ways clear and the sliding parts in place and in line with the work. This keeps the oxide free and reduces the back-pressure. The bottom parts of the grids inside nearest the side of the purifier are to be V-shaped, so that when the bottom scrapers S have passed over them there is no chance of oxide hanging in the gas-ways. Baffling grids are fixed at suitable distances apart to keep the weight of the oxide off the bottom grids, break up the flow of gas, and allow it to flow in a zig-zag direction. The revolving arms pass over and under them in a wind-mill style, so that when one arm is passing over one section of grids the other is passing over the opposite.

The front and back faces of the sliding parts of the grids are sharply bevelled, so as to push the oxide off the slides U. The paddles are to keep the oxide loose, so that it can drop into the receiver. When more than one section is to be worked in a purifier, and one section is to be discharged, the centre shaft is kept in motion, the grids are open full, and when the section is emptied they must be shut again and the ones above opened in the same way, so that the oxide can drop into the lower section. If desired, however, a little can be let out of each section at the same time and still be renewed from above at the same time. This can be done without turning the purifier out of action. The oxide can be drawn off from the receivers by opening the top valve first and allowing the oxide to fall to the second receiver, then shut the top valve, and by opening the bottom one the oxide will fall in a pile or into trucks.

The purifier would be worked the same as a gas-washer—the centre shaft kept always in motion.

Inverted Incandescent Gas-Burners.—Anderson, W. & H., of Edinburgh. No. 11,894; May 25, 1904.

This invention—relating to inverted incandescent burners, with the object of providing means for reducing the vibration of the mantle to a minimum and to attach or suspend the globe in an improved manner—is referred to on page 892.

Gas or Air Compressors or Pumps.—Keith, J. & G., of Farringdon Avenue, E.C. No. 12,413; June 1, 1904.

This invention relates to gas or air compressors or pumps of the kind described in patents Nos. 14,057 of 1897, 15,291 of 1898, 13,926 of 1900, and 16,436 of 1902; and it has for its object "to provide an improved construction wherein the whole supply of gas is taken from the space between the holder and the enclosing hood, and wherein the water supply is arranged to be cut off at a given point without any adjusting means, as is necessary in the case of a cock worked with a long lever."

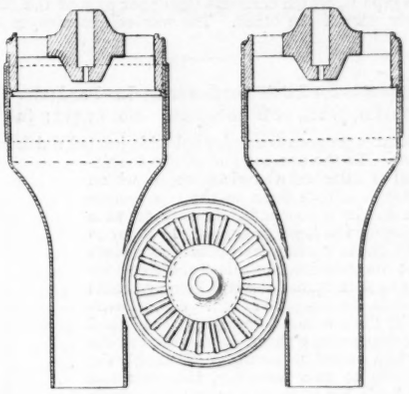
The apparatus comprises a holder provided with a central tube which slides over a stand-pipe connected with the suction valves of the pump as in previous arrangements; the holder being charged and discharged by means of two stand-pipes. The holder, while free to rise and fall vertically, is prevented from rotating by two pulleys running in channels. It is said that, under the invention, the wear and tear on the valve controlling the water supply is considerably reduced—in fact, brought to a minimum—as the controlling portion only moves when the number of lights is altered. While a given number of lights are in use, however, the controlling device adjusts itself in a position which allows the right quantity of water to flow through to work the motor at the required speed. The employment of the top cover for the holder tank obviates objections by insurance companies; for if the seal blows, it only blows within itself, and cannot get to the open air. The gas inlet being fixed on the top of the cover, the space between the holder and the cover serves as an anti-fluctuator.

Incandescent Gas-Burners.—Rose, A., of Birmingham. No. 14,164; June 22, 1904.

Two sectional elevations of this incandescent burner are given and a plan.

The burner-tip (of porcelain, steatite, or other non-corrosive material) is of cylindrical form open at the bottom and with radial or other suitable slots at the top, through which the gaseous mixture issues. The top of the burner also has the usual central boss and hole for the mantle-rod or the clip for holding it. The slots or holes in the top of the burner-tip are (by preference) made radial—diminishing in width towards the centre of the burner—with parallel sided ribs between each slot. The burner-tip fits easily in the top of the tubular body of the burner, and rests upon a shoulder in it, and is there secured by a cap made cylindrical so as to fit on to the body of the burner, and provided with a collar, which rests on the edge of the tubular body, and with an inwardly projecting flange or rim at the top, which bears upon and round the burner-tip, and thus secures it in the body of the burner.

The cap is, by preference, not screwed on to the body of the burner, but merely fits on it with sufficient tightness to enable the cap to be readily removed when required. When this has been done, the burner tip, which, in the first arrangement shown, stands a little above the top of the body, can readily be removed, cleaned, and readily replaced. When the burner is made in this way, the usual wire gauze diaphragm in the burner, for preventing flashing-back, may be dispensed with, as when the holes are arranged as shown the flame does not flash back.

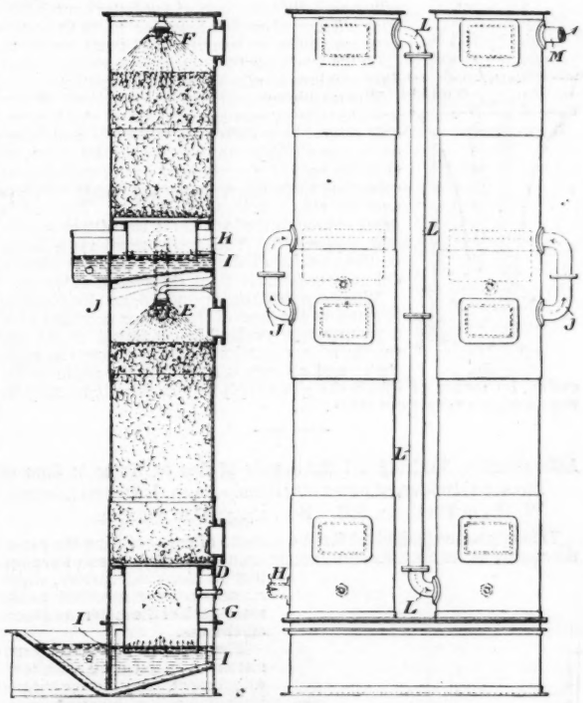


The burner-tip may be secured in the body of the burner, as shown in the second arrangement. Here the burner-tip may fit tightly in the cap and on the top edge of the body, and be removable from the body with the cap, which fits on and around the body as already described.

Gas Washing, Cleaning, and Cooling Towers.—Dixon, W., of Glasgow. No. 15,088; July 6, 1904.

In gas producer plants hitherto used for gas-engines or other purposes, the patentee remarks that it has been customary, for the purpose of taking out the dust, tarry, or other matters in the gas, to use various forms of washing, cleaning, and cooling apparatus; and among these are two well-known forms: (1) Commonly known as the "bubble washer," in which the gas is made to pass through water or other liquid under a loot plate. (2) Towers in which the gas enters at one end of the tower, and during its progress to the other end is washed, cleaned, or cooled by coming in contact with water or other element or substance.

The present invention is a combination tower and bubble washer; and one or more bubble washers may be placed in each tower, as shown.



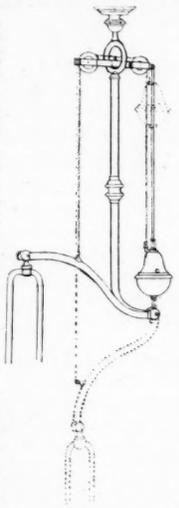
The interior of the tower is packed with coke supported on grids at two elevations. Beneath the strata of coke are mounted spray-nozzles; while at the top of the tower is another large nozzle. By the lower nozzle or pipe D steam is led in at the side of a loot or baffle plate G placed at the lower part of the tower, which is liquid-sealed. The two upper nozzles E F are suspended from the centre of the tower, and are designed to discharge their contents upon the gas as it percolates upward through the coke.

In operation, the gas is introduced by the pipe H fitted into the shell at the lower portion of the tower, and is made to pass through the plate G, where it enters by the apertures I. It then passes through the bed or stratum of coke and emerges into the central part of the tower, where it encounters the liquid discharged by the nozzle E, as it is made to traverse the bent pipe J, when it enters the tower at a somewhat

higher elevation. The gas, in like manner, has to pass through holes or apertures formed in the plate K similar to those already described, and is made to pass through the bed of coke contained within the upper part of the tower. At this point, it meets with the liquid discharged from the nozzle F as it passes from the left compartment to the right one by the pipe L, which connects the upper part of the one chamber to the lower part of the other. The washed gas escapes by the exit pipe M.

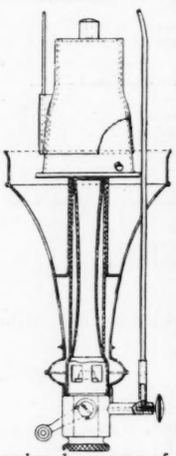
Sliding Apparatus for Raising or Lowering Gas-Pendants.—Lea, J. W., and Perrins, J. H., of Birmingham. No. 15,332; July 9, 1904.

The patentees propose to employ a double-jointed rod for suspending the pendant. To the one section of the double-jointed rod is attached a cord or chain, which passes through a ring fixed to the top section rod, and a weight is suspended so as to act as a counterpoise for the lamp or shade. In order to keep the weight in position and prevent it swinging against the pendant, there is a guide-rod for the weight to slide upon; the rod being parallel or nearly so to the top section rod. Also at each extremity of the guide-rod springs are attached to prevent unnecessary shock or vibration to the pendant when raised or lowered. To enable the cord or chain to run smoothly, there are two grooved wheels for it to run upon; the wheels being attached on either side of the ring mentioned.



Incandescent Gas-Burners.—Attenborough, E., of Nottingham. No. 15,371; July 9, 1904.

This invention refers more particularly to incandescent gas-burners constructed on the same principle as the "Kern." The lower or injector part of the burner is comprised of two lengths of parallel tubing, one of which telescopes within the other; and the double-cone formation of the interior is obtained by inserting a thin metal shell or lining of sheet metal bent or spun into the required form. With this arrangement, the desired interior formation is said to be more readily obtained, with the advantage that the upper part of the burner may be conveniently removed for cleaning or other purposes in the same way as the upper part of an ordinary incandescent burner.



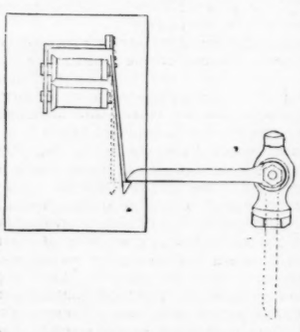
The lower telescopic tube fits within the upper tube; and the lower end of the latter is provided with a flange of such a diameter as to fit in the external casing at any required point, so as to close the lower part and prevent the collection of dust and insects near the air-inlet openings.

The mantle-support may be comprised of two upright rods set one on each side of the burner, and their upper ends provided with horizontal sockets or thimbles set one facing the other, so that the ends of a horizontal rod or cross-bar of refractory material can be sprung into the sockets and be retained in this position. The rod is passed through the loop at the top of each mantle and supports it. The two vertical rods, being on the exterior of the mantle, protect it when a chimney or globe is being removed or replaced.

When a pilot light is provided, an elbow casing is fitted to the base of the burner provided with a gas-passage, preferably connected to the gas supply at a point immediately below the stop-cock; and a screw is fitted into the angle of the casing, by means of which the gas supply to the pilot light may be regulated or entirely cut off.

Automatically Shutting off the Supply of Gas or Water in Case of Fires, Explosions, or other Accidents.—Pavis, J. P., and Edwards, W. H., of Peckham, S.E. No. 22,944; Oct. 25, 1904.

This apparatus is devised for the purpose of extinguishing the gas at the meter, as soon as the heat, acting on a thermometer, sets in operation an electrical battery, which releases a lever attached to the metal cock of the meter, and turns off the gas.

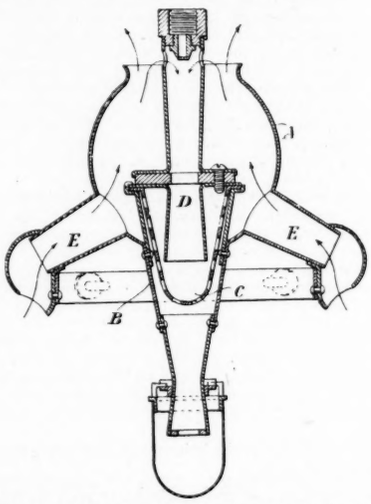


The apparatus (as shown) consists of a metal cock with lever attachment, an electro-magnet induction coil with armature, the necessary wiring, and a mercurial thermometer. The extinguishing contact consists of an ordinary thermometer, in the bulb of which a wire has been fused, the other end of which is connected with a terminal to which is attached a platinum rod. Any rise in the temperature, beyond a predetermined point, causes the mercury rising in the tube to touch the end of the platinum rod, and setting the battery in action, acts on the spring holding the lever attached to the cock of the gas-meter, causing it to fall and turning off the gas as it falls.

Inverted Incandescent Gas-Lamps.—Spreadbury, R. J., of Tunbridge Wells. No. 19,830; Sept. 14, 1904.

This invention in inverted incandescent gas-lamps has for its object "the supply to the bunsen burner of air which is less vitiated by the presence of the products of combustion of the burner than is the case with such lamps as usually constructed."

The illustration shows an inverted incandescent lamp of the kind described in patent No. 18,272 of 1904, modified according to the present invention. The hood or casing A is secured at its lower edge to the depending cone B surrounding the mixing-chamber C of the bunsen tube D. The parts are so connected as to exclude the combustion products from the interior of the casing, which may be formed in two parts—the upper part made detachable, and the outer surface of the lower part utilized as a reflector.



Extending downwardly and outwardly from the casing are a number of air-inlet tubes E, the lower ends of which are open to the air outside the globe, and preferably at a level below the top of it. The casing extends upwards to approximately the level of the air openings of the bunsen tube, and is open at the top, or it may be closed round the base of the bunsen tube above the level of the air holes and have air-outlet holes formed in its walls.

The tubes E and casing A being heated by the upward current of combustion products and heated air impinging on them, the air within the tubes and casing will in turn become slightly heated; thus causing an upward current of pure air from outside the lamp globe through the pipes and casing to the air openings of the bunsen tube, such air becoming heated to some extent in its passage, so that the bunsen tube is kept supplied with slightly heated air unvitiated for admixture with the products of combustion.

Operating Gas-Taps and Electrically Igniting the Gas.—Lorrain, J. G., a communication from the Société Anonyme des Allumeurs Extincteurs Automatiques, of Zurich, Switzerland. No. 1231; Jan. 21, 1905.

This invention relates to apparatus in which the gas is electrically ignited at predetermined times by a clock device; but it is said to differ from previous inventions of this class in that the gas-tap is not only operated, but the electrical energy which causes the ignition of the gas is mechanically generated by the same device—that is to say, by a clock—which operates the tap.

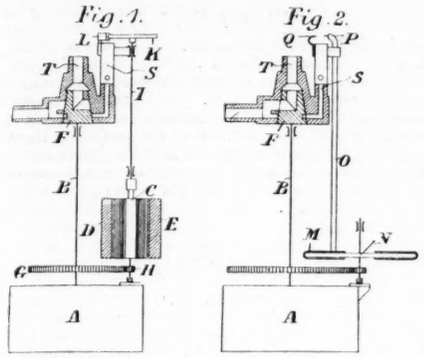
Fig. 1 (p. 895) illustrates apparatus where the current is generated by a magneto-electric machine. Fig. 2 illustrates apparatus in which the current is generated by an influence machine. Figs 3, 4, and 5 show the positions of the gas-tap the upper row indicating the level of the passages leading to the main nipple, and the lower row passages leading to the igniting nipple.

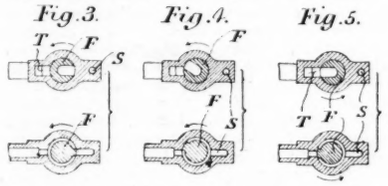
In order to operate the devices a clock A is used—of any convenient form. At predetermined times, the spring of the clock sets a shaft B in rotation; and this serves to open the gas-tap and operate the electric generator.

In fig. 1, the generator consists of a magneto-electric machine having an armature C and magnetic field poles D and E. The rotation of the armature is produced by the rotation of the shaft B, which also opens the gas-tap F, with which it is rigidly connected. As only a part of a revolution of the shaft B is necessary for the operation of the gas-tap, and as several revolutions of the armature C are necessary for the generation of the electrical energy, a toothed gearing, consisting of the large wheel G and small wheel H, is employed to multiply the rotation of the armature shaft. A vertical shaft I extends from the armature to a position above the gas-burner, and bears at its end a toothed plate K electrically connected to the armature. Against the edge of this plate, a spring L, mounted at the top of the burner near the gas-outlet, presses. The rotation of the plate therefore produces a quick make-and-break effect, and causes the formation of sparks, which ignite the gas issuing from the nipple S.

In fig. 2, the magneto-electric machine is replaced by an electrostatic or influence machine M N, the rotation of the movable part N of which is produced in the same way as the rotation of the armature C in fig. 1. In the present case, no make-and-break device is necessary, as the electricity generated by the influence machine has sufficiently high pressure to traverse the space between the sparking points P Q and so ignite the gas. All that is needed is a good insulated wire O,

led from the machine to the burner, the free extremity P of which is opposite to the uninsulated point Q, near the gas-outlet.





The burners shown in figs. 1 and 2 are adapted for incandescent mantle lighting; an igniting nipple S being shown at the side of the main nipple T. The tap is so constructed that the supply of gas for the igniting nipple is effected only during its turning movement. If the tap is in one of its extreme positions—corresponding either with the "full on" or "full off"—access of gas to the nipple S is stopped.

Figs. 1 and 3 show the passages in the gas-tap which lead to the igniting and main nipples in the "full off" position; so that neither nipple receives a supply of gas. Figs. 2 and 5 show the parts in the "full on" position, so that gas is supplied to the main nipple but not to the igniting nipple. Fig. 4 shows the passages when the tap is in a position intermediate between the "full off" and "full on" positions. In this case, the supply to the main nipple has been commenced and that to the lighting nipple has not yet terminated. It is assumed that the tap has to make half-a-revolution for opening and half-a-revolution for closing. But it is obvious that the passages may be so arranged as to require other fractions of a revolution for opening or for closing.

APPLICATIONS FOR LETTERS PATENT.

11,725.—Goskar, T. A., and Burn, L., "Suction gas-producer plants." June 5.
11,746.—Tournier, V. C., "Gas-engines." June 5.
12,751.—Moores, W., and Bailey, A. A., "Air gas." June 5.
11,776.—Clark, F., "Purification of gas." June 5.
11,811.—Martron, O. E. C., "Igniting gas." June 6.
11,834.—Collett, A. E., "Incandescent lamps." June 6.
11,844.—Shirley, J. I., "Distributing valves." June 6.
11,855.—Sproxton, K., "Gas-globes." June 6.
11,888.—Lucas, A. W., "Incandescent lamps." June 6.
11,919.—Sproxton, K., "Holding inverted globes." June 7.
11,938.—Jacob, C. & P., "Adjustable burners." June 7.
11,940.—Galley, S. V., and Hatton, J. C., "Mixing gases for heat, light, and power." June 7.
11,956.—Woodall, H. W., and Duckham, A. M'D., "Vertical retorts." June 7.
12,017.—Harrison, C. W., "Bunsen burners." June 8.
12,022.—Taylor, W. T. P., and Notley, R. V., "Radiating heat." June 8.
12,059.—Moore, W. H., and Livens, F. H., "Gas-producers." June 9.
12,102.—Debernardi, F., "Automatically lighting and extinguishing gas-lamps." June 9.
12,104.—Siegenberg, L., jun., "Burners." June 9.
12,164.—Collett, A. E., "Valve for low-pressure incandescent and other gas-burners which require to be operated or controlled from a distance." June 10.
12,176.—Körting, E., "Retort-settings and regenerator furnaces." June 10.

Gas-Works in Germany.—The demand for gas-works by small towns down to 3000 inhabitants is increasing in Germany. In 1904, about eighty new gas-works were erected in such towns; they cost from £4500 to £6000. The demand for gasholders, gas apparatus, &c., was equally satisfactory, not only for the home supply but also for export, which extends to Austria-Hungary, the Netherlands, Belgium, Italy, Denmark, Norway, Sweden, Russia, Spain, and Portugal. An order for the erection of complete gas-works plant in Japan was placed with a Berlin firm.

Lighting of Liskeard.—With a view to the adoption of incandescent lighting in the public streets, the Liskeard Town Council have entered into a new agreement with the Gas Company. It is to run for three years, and the price to be paid is at the rate of 3s. 9d. per 1000 cubic feet, ascertained by meter. The Company are to keep in repair all service-pipes, lamp-pillars, and brackets; but the Corporation will provide and maintain all lamps, incandescent burners, &c. The Corporation will pay a rent to the Company for the use of the pillars and brackets, and will also pay the Company for the lighting and extinguishing of the lamps.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Edinburgh Well Pollution Case.

Sir,—In your report of the evidence led in the case of *Muir v. Edinburgh and Leith Gas Commissioners*, it is necessary to make a slight correction as regards one of my statements in cross-examination. In speaking of the percentage of nitrogen in the several tars in question—viz., coal-gas tar, water-gas tar, and oil-gas tar (Pintsch's process)—you report me as having said that "nitrogen itself was absolutely of no value in attempting to differentiate between oil-gas tar and coal tar." What I did say was that the percentage of nitrogen in coal tar is from 1 to 1·25 per cent.; but that the nitrogen present in water-gas tar and oil-gas tar (Pintsch's process) is the same in both tars—less than 0·10 per cent.—and could be of no value as a factor in distinguishing between the two latter.

It may be noted that while water-gas tar and oil-gas tar are very closely allied in character, experimental investigation has provided definite factors to distinguish them.

Corporation Gas-Works, Alloa, June 10, 1905. J. W. Napier.

Christiania and its Gas Supply.

Sir,—In your issue of the 6th inst., a short paragraph appeared congratulating the owners of the Christiania Gas-Works upon the increase in the consumption of gas in 1904.

The owners—the Corporation of Christiania—seem, however, to look upon the matter in a very different way. The increase has, of course, necessitated a considerable outlay of money for meters, pipes, &c.; and the consequence is that the Corporation have had no direct income from the gas-works for the year. They therefore consider the result unsatisfactory, and blame the Manager to such extent that they have even suspended him from his position and appointed a Committee of Inquiry. The Manager is reproached for not having applied for the necessary grants beforehand; although in previous years it has been the custom that funds required in consequence of an increase of trade have been at the disposal of the Manager without grants.

June 15, 1905. C. Kaurise,
Manager of the Gas-Works, Throndbjem.

Mr. G. R. Hislop, of Paisley, writes: Under the discussion on Mr. Bond's paper, on "Pyrometers," at the recent meeting of the Institution of Gas Engineers, I am made to say that "1 per cent. of water in coal would diminish the gaseous results by 33 per cent., and that the difference would not be found in the tar-well." What I did say was that 1 per cent. of water would affect the gaseous results by 3½ per cent., and that the difference would be found in the tar-well."

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, May 8.

(*Before Mr. Justice* Kennedy).

Ridley, Whitley, and Co., Limited, v. Metropolitan Water Board and S. Pearson and Son, Limited.

This was an action to recover damages for injury occasioned to the plaintiffs' premises through the flooding of the River Lea. The Metropolitan Water Board had been substituted as defendants for the East London Water Company, by whom the works in question were constructed; and the other defendants were the Contractors who carried them out.

Mr. Montagu Lush, K.C., and Mr. Acland, K.C. (instructed by Messrs. Roche and Sons), appeared for the plaintiffs; Mr. Cripps, K.C., M.P., Mr. Danckwerts, K.C., and Mr. Bartley (instructed by Messrs. Bircham and Co.) represented the defendants.

Mr. Lush, in opening the case, said the plaintiffs were manufacturers of linoleum and floorcloth, and were owners of the freehold of the Angel Works at Chingford, on the west bank of the River Lea. These works had been carried on by plaintiffs and their predecessors for more than forty years, and were quite close to the old river; and although the valley had always been liable to be flooded in times of heavy rain, the works had never been damaged before June, 1903. In 1897, the East London Water Company obtained an Act authorizing them to carry out certain works in the vicinity of those of the plaintiffs. They were empowered to construct a large reservoir, and to make an aqueduct, conduit, and a cutting for the diversion of the River Lea opposite the Angel Works. There were certain provisions inserted for the protection of plaintiffs and other occupiers of the land, including one which said that the cutting should be so constructed as to be capable of discharging and carrying off a like quantity of water to that then discharged and carried off by the channels of that part of the river. These works were for the purpose of increasing the Company's stock of water. The reservoir occupied the large space of some 42 or 43 acres, and was completed and opened in May, 1903, just about the time the damage occurred. This reservoir practically imposed a barrier to the flow of the water both in the river and in a small feeder canal; and it was in

consequence of this that the provision was made in the Act in regard to the cutting which diverted the waters from the river and the canal which formerly ran over the space covered by the reservoir. This cut had to be made by the defendants; otherwise, when the water from the river and the canal reached the reservoir it had nowhere to go. It could not go into the reservoir, because this had an embankment all round it of an impervious wall, which prevented any possibility of the water getting into it. The reservoir was actually supplied from the aqueduct by a pumping-station, and the water came in from the river at Chingford Mill. He was instructed that the level of the water in the reservoir was higher than that of the water of the river when at full. There was one important fact which must be borne in mind in connection with what happened in this matter. The soil of the valley was of gravel, with a bed of hard London clay several feet down; and the consequence was that, although this valley had been liable to flooding as long as anybody could remember, whenever the whole of this part of the land through which the river and the feeder canal ran was flooded, the water percolated through the gravel, and the level would be the same as that of the river. The whole of the land operated as a sort of conduit which enabled the water to get away. When the Company made the reservoir, they had to shut out the water from going through this gravel soil; and they constructed an impervious embankment or wall to the reservoir, which not only penetrated to the bottom of the gravel strata, but went down some distance into the hard clay. The reservoir therefore served to shut off the whole of the 42 acres which had served as a conduit; and his Lordship would see from the plans that whereas in the old days in time of flood the waters at that place used to run down the whole of the valley, they could now only run down a kind of bottle-neck. These works were authorized by statute; and whether the statute had imposed on the defendants any liability in respect of them was a point which he would not stop to discuss. There was something else which the defendants did which was not authorized, and which was, if not wholly, at least a good deal the cause of what happened. In 1898, a temporary railway or tramway bridge was constructed by them, which was there in June, 1903, and was still in position. It ran at a very obtuse angle across the river, and was used for carrying materials for the construction of the works. His Lordship would appreciate the extreme importance of two things—first, that the diversion of the cutting should have been sufficiently wide and deep to afford additional escape for the water, inasmuch as the defendants had removed this large extent of the natural outlet for flood water. Further, it was still more important that they should not do anything to obstruct the cutting after they had made it. But, unfortunately, this bridge did offer considerable obstruction to the flow of the water down the cut in time of flood; and when the water was rushing down from north to south, the piers of the bridge tended to dam it back on the upper side. The result was that in time of heavy flood, as happened here, wreckage came sweeping down the river, and got caught on the piles of the bridge—thus further diminishing the sectional area through which the water could flow. Plaintiffs alleged that the flooding of their works was due to three things, though the bridge caused the ultimate mischief. First, the reservoir had abstracted a large area of the water way, and caused the bottle-neck; secondly, the cut had not been, as he submitted, made adequate to carry off the waters; and, thirdly, there was the bridge. They were not troubling about the amount of damage; and in the event of his proving that he was entitled to succeed, that matter would be dealt with elsewhere. His Lordship had only to deal with the question of liability. The facts were that on June 13, 14, and 15, 1903, there was a very heavy rainfall, which exceeded an inch a day. On the afternoon of the 15th of June, the water was seen to be entering the wheel-races where the plaintiffs' engines were, and the engines were stopped. Very early on the morning of the 16th, a representative of the plaintiffs was fetched; and on going to the works he found that the water was rising through the floor of one of the warehouses, and it appeared to be swelling from the south—the bridge being to the south of the works. Some goods were moved away, and the pumps were set to work. The Manager (Mr. Gray), in company with Mr. Whitley, the Managing-Director, went to look at the bridge. They found that the footbridge, which was on the same side as the railway bridge, had been washed away, while the water was being held back by the reservoir and by the bridge. On the afternoon of the same day, the water was still coming up through the floors of the warehouses and other buildings; and it was also flowing over the river banks north of the works. Plaintiffs procured fire-engines to assist the pumps. The water by this time had risen to the level of the planks laid down on the bridge, and was lifting the sleepers. When it reached the level of the planks, of course it met with a solid obstruction. Underneath it was only blocked by the piers and the wreckage which had accumulated; but when it got higher the bridge presented a solid mass and increased the damming. The footbridge which was washed away was not replaced; and it was the railway bridge which was the real obstruction. The flood continued to rise, and workmen were engaged clearing away the *débris* which collected. Plaintiffs' witnesses called the attention of the defendants to the fact that the water was being kept back by the bridge. Early on the morning of the 17th, it overflowed the west bank of the river completely, and practically flooded the whole of the plaintiffs' works, the damage to which had been enormous. There was one more fact to which he should ask his Lordship to attach some importance. It would be proved that the damming up of the water owing to the bridge created such a head on the north that it at last succeeded in scouring out a large channel underneath the original level of the bed of the river. The bridge being strong enough to stand, the water found an outlet by scouring out 5 feet of the river bed. With regard to the defence, he did not know what pleas would be relied upon; but there was one to the effect that the rainfall was abnormal and unprecedented, and therefore that it could not have been reasonably foreseen or anticipated that it would have to be guarded against. This was a plea of the act of God; and he did not know whether or not it would be pressed.

Mr. CRIPPS said that point would certainly be pressed very seriously, as well as other defences.

Mr. *George Whitley*, the Managing-Director of the plaintiff Company, Mr. *F. Lewis Gray*, the Manager of the Angel Works, and other witnesses, gave evidence in support of the plaintiffs' case.

Tuesday, May 9.

On the hearing being resumed to-day,

Mr. *A. C. Payne*, examined by Mr. ACLAND, said he was familiar with the *locus in quo*, and had carried out works in the valley of the Tottenham and Forest Gate Railway. He went down to the works on June 16, 1903, and drove from the railway station along the canal. There was no water over some portions of the works, but there was over the valley. In the works the water was about 8 inches under the floor of the stores, and water was being pumped out by a steam-engine. He did not see any water in other places; but it was all over the marshes to the north of the building. There was no water that would prevent access to the other buildings; but he could not say there was none in the race of the wheel. There was none to the west of the canal on the 16th; but it was all over the slope of the bank on the north side. The water was all surrounding the Angel Works on the north and south sides; while cut No. 3 was flooded. The pumping-station could be seen; but the Ching Brook diversion was covered with water, which was being held back by the temporary bridge in cut No. 3. The old diverted stream was partially filled up at either end, but not in the middle. The next day witness walked down the towing-path to the bridge, and found the water level on the high side of the bridge just up to the top of the sleepers. There was a tremendous eddy under the bridge and wreckage coming down. Witness stayed there long enough to see the damming up of the water by the bridge. On the 17th he found the water right up to the level of the towing-path on both sides between Cook's Ferry Bridge and the works; and he could only get about the works in a cart. At the south the water was right up, and was all over the canal bank and marsh. He thought the works which had been constructed—reservoir No. 1—had undoubtedly dammed back and held up the flow of water above and under the ground, and had so produced an effect on the flow of the river. Prior to the construction of the works, there were about 600 yards of marsh over which the floods could extend and flow. If the Lea had overflowed its banks in the conditions which existed before the reservoir was built, it would have had a large area to flow over. The new cut No. 3, the Lea diversion, the copper-mill stream, and the Banbury reservoir reduced the outlet for the flood water from 600 to 30 yards. As building proceeded higher in the valley, and new streets were laid out, the tendency must be to bring the water down with greater rapidity, and in his opinion the existing cut was inadequate. Putting together all the facts he observed, his opinion was that the cause of the flooding of the works was the combination of the dam or reservoir across the valley, the insufficiency of the cut, and the obstruction of the bridge.

Cross-examined by Mr. CRIPPS; He did not recollect that any damage had been pointed out to him when he went down in June. He admitted as possible the assumption that the water had got into the navigation at a higher point, and so assisted in the flooding. In his opinion, as an engineer, the Banbury reservoir, as an obstruction, headed up the water which would otherwise have travelled over the marshes.

In the course of some conversation, Justice KENNEDY remarked that the contention of the plaintiffs was now clear—that, irrespective of the natural effect of heavy rains and flooding of the river which adjoined their works, water was penned back in such a way that the necessary result was that it came up into the works; but this, in his opinion, must rest, to a certain extent, on the levels, and he should have thought a model would have been of great assistance.

Mr. DANCKWERTS said if his Lordship would visit the works it would be much better.

Justice KENNEDY said he might do that later.

In answer to his LORDSHIP, witness further said he suggested that the influx of the water into the navigation from the river at the higher point of Cook's Ferry would be affected by the reservoir works; and he thought the damage was far-reaching.

In re-examination, witness said that in the case of a river flowing down a more or less deep gradient through a valley, if it was dammed up partially or entirely it would have an effect higher up the river, where the water was still running down in the direction of the exit. An obstruction would check the flow; but the water would rise even when the obstruction was covered, if it could not flow over the side-lying ground.

Mr. *G. E. Eachus*, the Consulting Engineer to the Edmonton District Council, said he visited the works on the same day as the last witness, and described the damage he saw done there. In his opinion, the construction of the two reservoirs, which had removed a large area of land into which the floods used to spend themselves, and in which they used to travel in a southerly direction, had so narrowed the waterway between the reservoir and the navigation that many portions of land along the whole length, right away from Tottenham Lock upwards, which had never been flooded, were now covered; and, so far as he could judge, the flood level had been raised nearly a foot.

Cross-examined by Mr. CRIPPS: The River Lea had not a free outlet, and therefore the ordinary rule with regard to the level of water was inapplicable. He thought the cut, the temporary bridge, and the reservoir all affected the question. If there had been no reservoir and no obstruction outside the cut, he did not think it and the bridge would have influenced the flood in 1903, because the waterway would have been so much larger than it actually was.

Mr. *G. M. Taylor*, examined by Mr. LUSH, said he had been acquainted with the alteration of the lie of the land through the construction of the reservoir, and knew the levels of the plaintiffs' works, the bridge, and the land in the neighbourhood of the floods. In his opinion, the construction of the bridge had a considerable effect on the penning-up of the waters. Asked what effect the reservoir, apart from the bridge, would have on the flood, witness replied that the impervious wall would cut off the underground and invisible portion of the river, and would be a complete barrier on the east side of the navigation. There would have been no engineering difficulty in increasing cut No. 3 so as to enlarge the escape of water in flood time.

Wednesday, May 10.

Mr. *Taylor*, in further examination by Mr. LUSH, said he had no doubt that the narrowing of the throat of the cut through which the water passed at the time of a great volume coming down, must tend to raise the gradient for a considerable distance up. He had made a tabular statement which showed the volume of water coming down over Feilde's Weir, which supplied the stream below the plaintiffs' works. On Jan. 20, 1890, it was 39,000 cubic feet per minute; on March 21, 1890, it was more than 100,000 cubic feet; on Dec. 14, 1891, it was 112,000 cubic feet; in November, 1894, it was 123,000 cubic feet; in February, 1897, it was 105,000 cubic feet; and in February, 1900, it was 100,000 cubic feet. There was no excessive flow in 1901 and 1902. The time of the actual flood was during June 13, 14, and 15; and the volume of water flowing over the weir was very much less than it was at any of the dates mentioned. Viewing these figures as an index of the amount of water passing down the river, the inference he drew was that there must have been some circumstance, other than the bulk of water, which caused the floods at the plaintiffs' works.

Cross-examined by Mr. CRIPPS: The calculations he had given were theoretical ones, and based on figures supplied to him by Mr. Payne. He thought a heavy rainfall on three continuous days would be less likely to cause flooding in the summer than in the winter.

Mr. CRIPPS said he was going to submit, for the defendants, that it was absolutely no test of the flood to take gaugings at Feilde's Weir, as had been done.

Mr. *F. A. Folworthy*, a carman and farmer at Chingford Hall Farm, said he had lived there for seventeen years, and had never known the Lea to overflow its banks before June, 1903. The water came right up to witness's farm, and he marked the place with flags.

Cross-examined by Mr. CRIPPS: The flood did not begin to abate till a day or two afterwards; and for three days witness had to fetch the carmen and labourers across to work and take them home at night. The flood was at its highest on the morning of June 17.

Mr. *F. L. Gray*, recalled, stated, in answer to Mr. LUSH, that he saw water coming in from the navigation into the plaintiffs' works; but the flooding of the premises which caused the damage was 24 hours before that.

This closed the plaintiffs' case.

THE CASE FOR THE DEFENDANTS.

Mr. CRIPPS, for the defendants, said the main defence was that the bridge in question, and the bridge combined with what had been called "other obstructive works"—that was to say, the cut and the reservoir—did not and could not have affected the flood in such a way as to cause the damage of which the plaintiffs were complaining. The real explanation was that in June, 1903, there was a flood of so unprecedented a character that people most cognizant with the flooding of the Lea could have neither expected nor anticipated it; and seeing that the plaintiffs' works stood in a very curious position at right angles to the valley for something like a quarter-of-a-mile, they felt the full force of the flood coming down from the north, unaffected by anything that took place below, with the result that no doubt on the north and east sides the water came over the wall. On the other side also, the conditions which affected the plaintiffs' works were entirely outside and beyond any possible effect as regarded the bridge or the other alleged obstructive combinations. Not only was the flood of 1903 unprecedented, but the quantity of water coming down the valley was equally so. He therefore submitted that there was no liability upon the defendants as regarded the reservoir or cut; while as to the bridge, he contended that there had been no failure of duty on the part of the defendants whether under the then Act or in their position as riparian owners. Counsel then referred at length to the cases bearing on the point at issue.

Mr. *H. J. Tingle*, of Messrs. Pollard and Tingle, the Engineers to the Lea Valley Drainage Commission, said the works in question were carried out by the East London Water Company with the approval of his firm and the Conservators of the Lea, and in accordance with the approved plan. He was not aware that they fell short in any way. The bridge was constructed in an ordinary and suitable manner for the purpose intended; and it was to the interest of the Conservators to see that there was no improper obstruction. The Angel Works stood directly across the access to the valley, and nearly at right angles to the access of the flow at flood time. They were constructed in part on made-ground and were thrust forward a quarter-of-a-mile into the flood area; and when the flood came down, it practically struck the works at right angles. The flood of 1903 was an unprecedented one, and the conditions which led up to it were such as he had never known before in the Lea Valley, with regard to the amount of rain which fell both on three days and on the five days prior to the maximum flood. He had examined all the tables of floods, and had not been able to find anything in the last twenty years comparable with that of 1903.

Thursday, May 11.

Mr. *Tingle* was to-day further examined by Mr. DANCKWERTS. He said it was quite unreasonable to have anticipated such a rainfall and flood as took place in June, 1903; the rainfall extending over the whole of the watershed. The Angel Works being straight across the axis of the valley would expose them to liability to flooding. They were within the flooded area. The works were erected on the marsh, on land which had been artificially raised. It was not conceivable, in his opinion, that the works should have been flooded by reason of anything connected with the new cut, or that took place in regard to the size or construction of the reservoir or bridge. He held that the new cut and weir with the bridge gave a better way to the water than the former condition of things.

Mr. DANCKWERTS: Quite apart from that, could these works have caused the flooding from the navigation?

Witness: Certainly not. There is no connection whatever. The navigation is at a considerably higher level.

Did any flooding take place, in your view, from the old river and the weir?—The water must have got over the wall round the north and east, because the flood levels were above those of the top of the walls; therefore any building lying within the flow of the water, if it were below the level of the flood, would probably be flooded from that source.

Further examined, witness said the water that came from the old river into the works could not, in his opinion, have been brought in by anything connected with the new cut or bridge.

In cross-examination by Mr. LUSH, witness said no flood levels were taken accurately before 1894. In his report to the Drainage Commissioners, after the flood of 1903, he gave the discharge of water as gauged at Feilde's Weir. He thought the best way to get at the cause of the flood was to ascertain the comparative quantities of water going over the weir at different times, and work on this basis. From 1892 to 1894, he was engaged in improving the waterway of the valley, to allow a better outlet for flood water, and extensive works were constructed. Fixed dams were removed and replaced by moveable gates. There was a flood in 1897 which did no damage to plaintiffs' goods. When the Act of 1897, which gave the defendants power to make the works in question, was passed, a protective section was obtained by the Drainage Commissioners, as witness advised that they might be held liable in the event of damage by scour taking place at the Angel Works.

In reply to Justice KENNEDY, witness said in his view there was a fallacy running through the whole argument with regard to the outlet of the reservoir, because, at the time of flood, so far as there was a gravel area to the eastward it was surcharged with water, and could not relieve the river at all; and so far as it was not a time of flood the river acted as a kind of drain, and whatever there was to the eastward would drain into it in time.

Replying to further questions by Mr. LUSH, witness said in time of flood there was no exit for any of the water in the gravel bed, which was surcharged and was like a full sponge. The bridge did not cause any serious obstruction before the flood occurred, because the water had scoured its own channel. In providing the works, the Company had to be satisfied that cut No. 3 was adequate to carry off flood waters from the northern boundary of the Angel Works, and there was a further provision in the Act that it had to be equal to the discharging capacity of the old channels. He thought he had satisfied the obligation when he had provided a new channel cut No. 3 that was of equal discharging capacity to the old channel—62,000 cubic feet running bank high; and he made no other provision for carrying off flood water. The works he supplied he knew would, without backing up the water any more than under the old conditions, discharge a greater volume than was attained before. He had no doubt about that. He admitted that a flood in June of a given amount of water would produce a greater disaster than the same quantity of water in the winter, because the water would be held up by the hay and the vegetation, and so would not get away so quickly.

In the course of some conversation,

Justice KENNEDY said the question would be whether the defendants had either done something which was short of what they ought to do under the Act, or whether, having powers under the Act, they had acted negligently. (To witness:) You have not attempted, in exercising such powers as the skilled advisers were exercising for the Commissioners, to provide a cut or any arrangements connected with the new cut which would prevent floods.

Witness: No, my Lord.

In re-examination by Mr. CRIPPS, witness said in his opinion the cut and the bridge, putting the reservoir quite out of sight, would have facilitated the passage of the floods, and with the reservoir he contended there was a better passage for them than ever before.

Charles Durden, a labourer at the East London Water-Works, was called to state the height of the water flowing out of the navigation on to the marsh on the 17th of June.

Mr. *C. N. Tween*, the Chief Engineer to the Lea Conservancy Board, said the flood of June, 1903, was the greatest, for a summer flood, of which they had record. It was something quite out of the common. The water overflowed the banks and a considerable volume escaped. The water came from the east into the navigation, and then it overflowed at plaintiffs' works, and washed the towing-path there from west to east. In 27 years' experience, he had never before known the water to overflow the towing-path at this point. In his opinion, the new channel from the Angel Works downward was an improved one, greatly facilitating the getting rid of water. The overflow from the navigation at the Angel Works had nothing to do with the new cut.

Dr. *Hugh R. Mill*, a Director of the British Rainfall Organization, said in three days in June, 1903, the average rainfall was 4·1 inches; and, so far as he could ascertain, there was no other record at all approaching this.

Mr. *C. W. Sharroch*, an engineer and contractor, was also called, and said he agreed with Mr. Tingle's evidence.

Friday, May 12.

Some further evidence having been given for the defendants,

Mr. CRIPPS proceeded to address his Lordship.

Justice KENNEDY said it struck him that the main point in the case which formed the question of actionable or non-actionable conduct must turn on the placing of the bridge. He might add that it seemed to him that the main question as to fact on which he wanted to hear Mr. Cripps was as to the point whether or not the water that did the damage to the works, or part of the damage, was water which was penned back because the obstruction existed. And, further, if it was the water that was not penned back, but which came from the navigation stream at a higher point, without saying that this left no case for Mr. Cripps to answer, it would be a very much weaker one.

Mr. CRIPPS said he agreed with his Lordship whether or not the construction of the bridge in fact caused the damage was one matter; and he should say that it did not, and should call his Lordship's attention to the evidence. The other questions were whether there was any liability, even with the bridge, on the assumption that some damage was caused; and whether, under the Water-Works Clauses Acts or as riparian owners, the defendants acted negligently in putting the bridge across. If his Lordship took the test of reasonableness, he would

have to consider what they might have to anticipate as regarded a flood and water conditions. The defendants had given evidence to show that what happened in 1903 was unprecedented, which meant—he did not like to use the words—what was usually called the "act of God." In other words, something happened which no man with reasonable forethought and anticipation could foresee, having regard to all the known conditions of the past. He was going to say, first, with regard to what happened, that long after the water had overflowed cut No. 3, which was some time on the 16th—in fact, when it had got beyond the piles and to the transverse portion of the bridge—no damage whatever had been caused to the plaintiffs' works; that was to say, no damage in respect to which the plaintiffs were now claiming compensation. And the great part of the plaintiffs' own evidence showed that, so far as the damage to warehouse A was concerned, it must inevitably have come from the navigation side, and not from the river side at all. If it came from the former, all the evidence was that neither immediately nor in any conceivable manner could the overflow of the navigation have been prompted or affected by the bridge.

At the conclusion of the learned Counsel's argument, the case was adjourned to the 17th inst.; it being arranged that his Lordship should in the meantime visit the *locus in quo*, and inspect it for himself.

Wednesday, May 17.

On the resumption of the hearing to-day,

Mr. LUSH summed up the case for the plaintiffs. He submitted that, under their Act, the defendants were bound to provide reasonable accommodation for carrying off flood waters, and that it was quite clear that the fact that the works which were carried out were done under the authority of this statute did not exempt the defendants from any consequences arising from the diminution of the area of the waterway in times of flood. This case fell among the class in which the right to do the work allowed by statute was subject to liability for any damage occasioned by such works. It was a matter for the discretion of the defendants; and if the reservoir acted as a dam, they should have enlarged the outlets for the water elsewhere. There was no limitation on them. They could have made the cut much wider and deeper. They were directed to make the cut large enough to carry off flood waters; and if they had not done so, plaintiffs had a cause of action. Mr. Cripps said that the plaintiffs must seek for compensation under section 68 of the Lands Clauses Act, because if their case was true their property had been injuriously affected. But he said the Act referred to had no application, and only applied when the land of the landowner was interfered with detrimentally by the lawful carrying out of statutory works, which was not the case here. It did not touch recurring damage by occasional floods, and damage to premises and goods. Further, this was an act done by the defendants which need not have been the cause of damage if they had not chosen to do it in the way they had. Section 68 only applied when the act was lawful under express powers, and there were injurious effects which would have been actionable but for the statute authorizing the works.

At the conclusion of the learned Counsel's argument, his Lordship reserved judgment.

Monday, June 5.

His LORDSHIP this morning delivered his reserved judgment. He said that, in dealing with the facts, the first question that he had to consider was whence the water came which caused the damage of which the plaintiffs complained. There were three dates involved—June 15, 16, and 17; but no claim was made for any damage on the 15th. As to the 16th, the natural and fair inference was that up to the evening of that day very little damage was done to the plaintiffs' works. He had come to the conclusion that the main inroad of water causing the damage occurred early on the morning of the 17th, and was due to the fact that a large volume of water in the Lea Valley to the north of the plaintiffs' works surmounted the east bank of the navigation, breaking through the towing path; and the surcharged channel of the navigation appeared to have been relieved by flooding to the west. A large volume of water flowing to the south found or forced an outlet for itself to the east, both into and below plaintiffs' works. The next question of fact to be considered was whether the defendants, by anything they had done, had caused, or sensibly contributed to, the flooding of the works; and this was a very difficult question. So far as the cut was concerned, if there had been no reservoir and no bridge, defendants' evidence satisfied him that in time of flood the substitution of the cut for the old and tortuous waterways was distinctly advantageous to the safety of the plaintiffs' works. Plaintiffs contended that the erection of the reservoir had taken some 43 acres of land which formerly allowed flood water to escape by percolation. The evidence, however, had not satisfied him that there was any loss of relief from flood water by percolation due to the construction of the reservoir which was of any practical importance. As regarded the bridge, there existed the very widest difference between the experts. Having carefully considered the conflicting theories, he had come to the conclusion that there was not sufficient proof that the flooding of the plaintiffs' works was due to the causes that were assigned by them. While the cut was an improvement on the old watercourse, he thought that the reservoir was rather disadvantageous in regard to its effect on the distribution of the flood water. He had no doubt also that the existence of the bridge, coupled with the entanglement of the *débris*, did create some penning-back for some distance from the bridge; but he did not feel able, in the face of the defendants' evidence, to hold that this penning-back extended so far as to be a cause of, or an essential element in, the flooding of the plaintiffs' works, or that the reservoir had any sensible effect. The evidence of Mr. Tingle and Mr. Bryan led him to the conclusion that, with regard to any danger of inundation which could reasonably be anticipated, the plaintiffs' works had certainly not been unfavourably affected by what the defendants had done. The evidence was clear that the three days' rainfall which produced the flood was not merely extraordinary, but, taking the area over which it extended, absolutely unprecedented so far as any record or information went; and even if he felt justified, which he did not, in holding that the defendants' works contributed to the flooding of those of the plaintiffs, the defendants would be exonerated from liability in such circumstances. He could not hold it proved that the defendants' works or any of them caused, or sensibly contributed to, the damage to the plaintiffs' property; and certainly he did not think that, under any circumstances which could reasonably have been anticipated at the time, they had been so constructed as to be a possible cause of injury. He must therefore give judgment for the defendants, with costs.

The Theft of Gas Coal at Falkirk.

On Wednesday last, John Robb, a weigher employed in the railway yard at Grahamston, Falkirk, was tried in the Falkirk Sheriff Court, on a charge of having, between Dec. 1, 1904, and March, 11, 1905, in concert with John Fraser (at present in the prison at Perth), stolen from the goods station at Grahamston, 36 tons of coal, the property of the Falkirk Corporation. The trial lasted several hours. In the course of it, Fraser, who was a clerk in the gas-works and is now undergoing a term of imprisonment for his share in the thefts, was examined, and stated that Robb suggested the theft of the coal, and had been the cause of his wrong-doing. Robb was also examined. The gist of his evidence was that Fraser asked him to sell coal, and that he did so without thinking there was anything wrong. Other witnesses stated that the coal was represented as having been sent to the gas-works in error, and that Robb always told them he was selling for another. Sheriff-Substitute Moffat found the charge not proved, and accused was discharged.

Some American Water Decisions.

Three recent decisions of the United States Courts are recorded in a recent number of "Engineering Record." The diversion of water by a municipal riparian owner was the subject of a decision of the Connecticut Supreme Court of Errors in *Osborne v. City of Norwalk*. The following is a summary of the opinion: The diversion of water from a stream by a city for use for municipal purposes is not warranted by the city's riparian ownership of the land at the point of diversion, where its beneficial enjoyment of the land is in no way promoted thereby. No increase in the amount of water permanently diverted from a stream can be lawfully obtained by a riparian owner by the stoppage of leaks of long standing in a dam at the point of diversion, to the prejudice of other riparian proprietors, although such repairs are necessary to maintain the efficiency of the dam. Defective water supply for extinguishing a fire was the cause of a case recently tried before the Tennessee Supreme Court. The decision is summed up as follows: Where a water company agreed to supply at all times a quantity of water sufficient to extinguish fires, their failure to do so, resulting in the destruction by fire of property within the contemplation of the contract, was the proximate cause of the loss. Where a water company contract to supply at all times an amount of water sufficient to extinguish fires, and a loss results from the burning of property covered by the contract, due to their failure to furnish water, the measure of damage is full indemnity for the loss resulting from the breach, and not merely the value of the water which should have been furnished under the contract. The diversion of water to supply a city not located within the watershed of the stream has recently been declared illegal by the California Supreme Court, whose ruling was as follows: "Where the owner of a prescriptive right to the use of all the surface waters of a stream for irrigation and domestic purposes attempts to sell the right to a city, necessitating the piping of the water beyond the watershed of the stream, the owner of a riparian right in the stream is entitled to enjoin such use without proof of damages; it appearing that, by permitting the water to flow in the usual way, some of it would percolate through the soil and again reach the stream, to the benefit of the riparian owner." Our contemporary says that though this decision is novel so far as it relates to underflow, it is the same in principle as several that have been made in Eastern States.

London Manufacturers and the Port of London.—At a general meeting of the London Waterside Manufacturers' Association (Incorporated), recently held at the Chamber of Commerce Building, Sir George Livesey (the President) referred to the fact that London stood pre-eminent as a commercial city, and this led to many ignoring or forgetting to some extent the point that it was also a great manufacturing city. Waterside manufacturers represented only a proportion of the manufacturing interests of London, but that they were no insignificant body was shown by the amount of capital invested in their industries and by the number of men employed. There was not far short of £100,000,000 of capital invested in waterside industries, and they dealt with some 7 or 8 million tons of imported raw material. Until recently there had been no sort of union or combination among the different members of this enormous manufacturing body. They were isolated, and, as a natural consequence, were very much ignored. When the Port of London Bill of 1903 was introduced, a meeting was convened by Messrs. Henry Tate and Sons, Limited, and others to consider what steps should be taken to protect their interests. As a result, Parliament recognized their right to be represented on any body that might be constituted to deal with the Port. The Bill had failed; and he was glad to say that the Bill introduced by the London County Council had also failed, as that body had modestly proposed that they should be allocated 24 members out of the 40 members of an authority to manage the Port of London. He hoped the Bill was dead and gone for ever, because, of all the public bodies to manage a great business, the London County Council was about the worst. With regard to the Thames Conservancy Bill, now awaiting second reading, he did not think that in its modified form there was much objection to it, except that it was clearly inequitable that the dues on sailing barges should be increased. He thought the London Waterside Manufacturers' Association was a highly important and most necessary body, and that its creation was a very important step, not only for their own advantage but for that of London generally

MISCELLANEOUS NEWS.

PLYMOUTH AND STONEHOUSE GAS COMPANY.

A Highly Satisfactory Year.

The shareholders of the Plymouth and Stonehouse Gas Company who attended the annual meeting on Thursday had the satisfaction of hearing of continued progress. Sir JOSEPH A. BELLAMY, the Chairman, presided.

The Directors in their report for the year to March said that the net result of the operations was highly satisfactory. The increase in the consumption of gas was not equal to that of some years, owing to the extremely mild winter and the general depression of trade, together with the almost universal adoption of the economical incandescent burner. Variations of consumption occurred from time to time; and there was an example in the year 1898, when, owing to a mild winter, there was actually a small decrease compared with the previous year. From the credit balance of the profit and loss account, amounting to £23,910, they recommended payment of a dividend of 6½ per cent. on the ordinary stock and of corresponding amounts on the additional and new shares. This would absorb £9961, leaving £13,949 to be carried to the credit of the next account. The recently-erected inclined retort house had given every satisfaction; the economy in the cost of manufacture being very considerable. In consequence of the growing difficulty in getting rid of the spent lime and clinker, the Directors had erected a brick-making plant—the first of its kind—to utilize these materials. The results were satisfactory. The entire make of bricks had been sold for a considerable period ahead; and instead of spending money to get the lime and clinkers removed, there would be a profit on the sales, after allowing for capital outlay, depreciation, and working expenses. The contract with Messrs. Richmond and Co. expires in July next. The Board had thought it desirable, in the interests of the Company, to regain their freedom of action; and they were also taking over the show-rooms for the purpose of developing the business under the direction of their own officers.

The CHAIRMAN, in moving the adoption of the report, said that the result of the year's working was in every way satisfactory. With regard to the profit, it had been a record year; the total amounting to the large sum of £30,702. It had been a year of great prosperity; and the Directors and shareholders had every reason to congratulate themselves on the strong position the Company had reached. The large sum realized as profit was, of course, in excess of what was required to pay the maximum dividend; but there were other contingencies which, as prudent men, they must provide for. Last year they put £3000 to the renewal fund, and this year they recommended that £3500 should be added to the same fund. On the debit side of the account was £10,000, representing the value of the old retort-house which was razed; and next year he hoped they would entirely wipe out this amount. They had also carried from the gross profit to the depreciation fund £4000 on account of stoves and cookers; and in connection with the slot meters, and to make good the fittings, &c., they had put aside £1080. What might be called their reserve fund therefore stood in this way—that their floating balance was £22,018, and they had in hand towards the maintenance and depreciation of stoves and meters £14,521, and towards the renewal fund £6500. In consequence of the desire of the Directors to keep the price of gas down to 1s. 9d. per 1000 cubic feet, they had some years ago to draw £4666 from the reserve fund to pay the dividend. It was clear now that it would have been wiser to have increased the price to 2s., because things at the works were not kept up to the standard of efficiency that was desirable. However, the Company were no longer in this position. On the contrary, since 1900 they had paid out of revenue account £10,000 for exceptional repairs, and £25,000 had been set aside to wipe out the old suspense account and build up the various reserve funds to which he had referred. The profits for the five years from 1896 to 1900 were £69,782; and for the last five years they were £127,726. In regard to the cost of producing gas, they had reached the lowest point in the history of the Company; the figure being 13·710d. per 1000 cubic feet. They had also reached the largest output they had ever had, and passed a total of 1000 million cubic feet per annum. The significance of these figures was emphasized when they remembered that in the five years in which they had been achieved they had to meet the competition of the electric lighting industry carried on by the town. Competition they must always be prepared to meet; but competition carried on by a corporation with the ratepayers' money as against a private undertaking might be very much more severe than one would have anticipated, especially when the Company had to keep up a proper depreciation fund and see to it that they got twenty shillings for every pound spent, and something more. Electricity was competing with gas for power purposes; and they had also the competition in this field of suction-gas plants. Being of opinion that the position of the Company justified their fighting the competition by all legitimate means, the Directors had decided to reduce the price of gas supplied for power purposes to 1s. 6d. per 1000 cubic feet; and this reduction would come into operation from Midsummer. Another matter which they had under consideration was that of a considerable reduction in the rental of gas-cookers let on hire. There was an enormous field here for further development. Another new departure would be made in taking over the business hitherto conducted at the show-rooms by Messrs. Richmond and Co. in the name of the Company. The Directors were of opinion that it could be worked to the benefit of the shareholders, and that considerable additional revenue might be expected. With regard to the brick-making plant, the position was satisfactory. They were not yet producing the quantity of bricks which they hoped to turn out; but the plant brought a profit to the Company, and they were improving month by month. As to the future of the Company, he thought that for the next few years they had every reason to expect a continuance of the present prosperity. They had made very advantageous contracts for coal and freight. In spite of the competition of electricity, the prospects of gas undertakings generally in the country were going up; and there could be no doubt that the improvements in gas lighting had gone far ahead of those in electricity. Badly as the streets of Plymouth were lighted with gas, owing to the trumpery burners used by the Corporation to reduce the consumption to a minimum, yet if they were put to the test, they were prepared to light any part of the town better than electricity at much less cost. He was pleased to again report that their relations with the men were of the most cordial character; and they were quite a happy family in this respect. The men did their work well, the staff of clerks had shown their usual devotion, and Mr. Heath, the Secretary, and Mr. Hoyte, the Engineer, had both done their level best. Mr. Hoyte introduced last year a new system effecting a saving of £500 per annum; and this year, through his ingenuity, they had been able to save another £500 a year.

Mr. J. H. S. MAY, the Deputy-Chairman, seconded the adoption of the report, which was agreed to; and the dividend recommended was declared.

Mr. MAY said that, in taking over the show-rooms from Messrs. Richmond and Co., they found that a saving of about £200 per annum could be effected in the salaries of officials and so on. The Chairman had agreed to act as Managing-Director of the Company, and would give his supervision to this branch of the work; and the Directors had decided to recommend that he be paid the £200 which would be saved by the arrangement. He moved—"That Sir Joseph Bellamy be not only Chairman of the Company, but Managing-Director, and the allowance made to him be increased to £600 a year instead of £400 as at present."

The resolution was unanimously carried; and it was further decided that the amount voted to the Directors should be increased by £250 per annum.

SOUTH SUBURBAN GAS COMPANY.

A Circular to the Consumers on the Price of Gas.

In last week's issue, a paragraph appeared, announcing the intention of the Directors of the South Suburban Gas Company (unless some way could be found of averting the increase) to return to the charge for gas of 2s. 6d. per 1000 cubic feet. The circumstances under which the last reduction in price was made, and an explanation of why that reduction must now be withdrawn, are set forth in a circular that the Board have addressed to the consumers. It is as follows:—

It is with great regret that the Directors announce an increase in price, for which they offer the following explanation.

In July last, they issued a circular stating their intention to remove the causes of the complaints of the inhabitants of the neighbourhood of the gas-works by ceasing to use carburetted water gas for enrichment, and by abolishing the use of lime for purification; and they informed you that the nominal illuminating power would be slightly reduced, making it the same as that of the neighbouring South Metropolitan, Croydon, and Bromley Companies.

To make sure that the consumers should have the entire saving from the abolition of enrichment, the price of gas was reduced by 1d.—to 2s. 5d. per 1000 feet, amounting to an aggregate saving to the consumers of £5500 a year. The Directors also undertook not to pay the extra 2s. 6d. per cent., or £719 of dividend to which shareholders would have been entitled.

They also asked that the experiment might have a fair trial, and promised to apply to Parliament in the present session for authority to reduce the illuminating power by abolishing enrichment and to abandon the use of lime. A Bill was therefore introduced which has passed both Houses of Parliament, and now only awaits the Royal Assent before becoming law. Parliament has granted relief from the use of lime; but, owing to the opposition of the Local Authorities, and mainly to that of the London County Council, authority to abolish enrichment and to supply unmixed coal gas was not obtained.

The objection was not to a reduction of illuminating power by ceasing to enrich, nor to the reduction of the standard price—the latter as offered by the Company being, as they were told, a satisfactory equivalent; but the proposal was defeated on a side-issue. The Company asked for authority to supply 13-candle power gas, to be tested in the test-burner as at present, in the way the consumer would burn the gas, by which a light would be obtained equal to 13 candles or more per 5 cubic feet of gas consumed. The London County Council, taking the lead in the opposition, although their jurisdiction extends over a very small part of the Company's district, demanded that the gas should be tested in such an uncertain way that a real 13-candle gas would appear as only about 10 candles.

Of course, this compelled the withdrawal of the clause, and another Bill must be introduced next year.

The effect of this opposition means, with the costs of next year's Bill, an expenditure of over £10,000, which necessarily prevents reductions of price to nearly that amount (under the sliding scale over 88 per cent. of all savings goes to the consumers, the exact proportions being £5500 to the consumers to £719 to the shareholders). If enrichment were of any advantage to the consumers, this argument would not be put forward; but it has been proved in the case of the South Metropolitan Gas Company that the abolition of enrichment is not the slightest disadvantage to the consumers, but the other way, for they burn no more gas, get as good a light, and are supplied at a lower price.

If the reduction to 13 candles had been agreed to, the price of gas would in a short time have been further reduced, but being now required to enrich to 15 candles, the penny reduction given last July must be taken back, and the price restored to that of last year—viz, 2s. 6d. per 1000 cubic feet from the taking of the indices of the meters at Midsummer. The charge in the September bills will therefore be at the rate of 2s. 6d. per 1000 feet.

If the Local Authorities should be willing to agree that, pending the application to Parliament next session enrichment shall be in abeyance, the Directors will gladly let the increase in the price of gas be also in abeyance, thereby giving to the consumers the money that would otherwise go for useless enrichment.

Illuminating power, as it is called, relates only to the use of gas in the old-fashioned ordinary burners—the most extravagant way of using gas. But until the incandescent mantle came into practical use a few years ago, it was the only way of obtaining light by means of gas; and on this fact the method of testing was founded. Illuminating power by luminous flame has now become quite unimportant, because the mantle requires, not a luminous flame, but heating power only to render the mantle incandescent, as may be seen by lighting the gas issuing from an incandescent burner without the mantle. By Dr. Welsbach's wonderful invention, gas has been made by far the most economical artificial light; the incandescent mantle giving about six times as much light from a given quantity of gas as was previously obtainable from the best of the ordinary burners.

The Directors therefore advise the consumers to adopt the incandescent mantle generally, as is done on the Continent almost universally. They will supply burners and mantles, and maintain them in full efficiency, for any of their consumers at cost price. By adopting this system of lighting, a consumer can treble his light and halve his consumption of gas, or, as is often the case, obtain even more than treble the light with a reduced saving—say, about 30 per cent., of his gas bill. The question may be asked, Why do the Directors advocate a system that will reduce their business? The answer is that from a narrow point of view this is true; but they wish to see gas hold its ground in the active competition to which it is now exposed. This it can do by the aid of the incandescent mantle, and for this reason they recommend its adoption.

In conclusion, the Directors repeat that if any means to avoid the increase of price can be suggested, nothing will give them greater pleasure than to co-operate to that end. The sliding scale identifies and unites the interests of consumers and shareholders, and makes a low price of gas advantageous to both parties.

On behalf of the Board,

June, 1905. (Signed) GEORGE LIVESEY, *Chairman*.

ST. HELENS CORPORATION GAS UNDERTAKING.

Reduction of Price all Round.

At the Meeting of the St. Helens County Borough Council on the 7th inst., the Chairman of the Gas Committee, Mr. Shaw, in moving the adoption of the minutes, said the Committee considered the results of the year's working very satisfactory, and that it reflected credit upon the Engineer and Manager (Mr. Samuel Glover) and his staff of officials and workmen.

Mr. Glover's report shows that, notwithstanding the fact that there had been a considerable falling off in the demand for gas by the large works of the town (there being twenty consumers whose total decreased consumption was upwards of 10 million cubic feet), the general demand had been well maintained. The same quantity of gas had been produced, and the general consumption had increased by 3½ million cubic feet; the total unaccounted-for gas being less by this quantity, thus bringing the percentage down to 3 4 for last year. The total quantity of gas made was 392,877,000 cubic feet. The increased demand for gas for gas-engines had been well maintained; the percentage increase for the year being 17·7. The total gas supplied through the coin meters (120 million cubic feet, sold at 33 feet per penny in the borough) had also increased, owing partly to the continued spread of rent-free cookers and other appliances; the percentage increase being 9·5 on last year's consumption, and the consumers having increased by 1047, from 7833 to 8880. It was shown that the total cash collected from these meters during the year was £15,032, which equals 32·3 tons of copper, being 3,619,759 coins. This is an increase on the previous year's takings of £1314. The whole of this amount was collected with a loss of only 5s. 11d. stolen from meters left in empty houses. This is a matter of congratulation to the management for the care with which the meters have been both purchased and inspected. The total income of the department for gas and residuals was £57,201, which is only slightly less than last year; and the net profit was £11,202, which is equal to 7·14d. per 1000 feet of gas sold—viz., 376,444,000 cubic feet. The total cost of manufacture, including coal and oil gas, purification (with all lime), repairs, coke-yard charges, locomotive and railway maintenance, and proportion of salaries, was £23,711. The net income from coke, tar-works products, sulphate of ammonia, and waste gas lime was £16,219, which leaves a net cost of gas into the holders of 4·57d. per 1000 cubic feet. As well as being regularly tested at the works, the gas is tested by standard apparatus at the Town Hall by the Borough Analyst; and his reports for the year give an illuminating power, tested by the "London" standard argand burner consuming 5 cubic feet per hour, equal to 18·51 standard sperm candles. The sulphur compounds, by the Gas Referees' test, equalled 9·04 grains per 100 cubic feet, and ammonia 0·77 grain per 100 cubic feet. The gas is equally enriched night and day, and is required by the Council to be maintained at 18 candles.

It was resolved that the profit should be appropriated as follows: To capital account for extensions of mains and services, £1202; to reserve fund, £5000; to the borough fund as the Finance Committee may direct, £5000; total, £11,202. It was also determined that the price of gas, as from July 1, should be as follows: For lighting and all purposes other than power: (1) When supplied through ordinary meters, 2s. 2d. per 1000 cubic feet within, and 2s. 8d. outside the borough, subject to the usual discounts, which are: 20,000 to 50,000 cubic feet per annum, 5 per cent.; 50,000 to 100,000 feet, 7½ per cent.; 100,000 to 1,000,000 feet, 10 per cent.; and 1,000,000 feet and upwards, 12½ per cent. (2) When supplied through prepayment or coin meters, 35 feet per penny, or 2s. 4d. per 1000 feet within, and 30 cubic feet outside the borough. For power, 1s. 8d. per 1000 cubic feet within, and 2s. 2d. beyond the borough, subject to the usual discount of 2½ per cent. monthly accounts. It was further resolved to increase the storage capacity from 1¾ million to 2¼ million cubic feet by the addition of a flying lift to No. 3 holder, the contract for which was given to Messrs. Clayton, Sons, and Co., of Leeds, who have undertaken to complete the work by the end of September. The price of 35 feet per penny through coin meters is said to make the gas sold to this class of consumers in St. Helens next to the lowest in the kingdom.

Another item of the report dealt with the question of naphthalene and enrichment; and it was stated that the last was the fourth complete working year during which there had been complete absence of worry from naphthalene in the district, whereas St. Helens used to be one of the most troubled towns in the country.

EFFECT OF CHEAP GAS AT WIDNES.

Practically Every Householder a Consumer.

At the Monthly Meeting of the Widnes Town Council last Tuesday, some interesting figures were given with regard to the undertaking which Mr. Isaac Carr has done so much to make famous.

In moving the adoption of the minutes of the Gas, Water, and Electricity Committee, Alderman H. S. Timmis said that the profit on the gas works for the year to March 31 was £6135, and on the waterworks £694. From the gas profit had to be deducted the cost of public lighting for the twelve months, £1796; and from the water profit, the net cost of the fire brigade department for the same period, £283. The total amount of coal carbonized at the gas-works during the year was 29,360 tons, from which was made 288 million cubic feet of gas. The amount of gas sold was roughly 276 million cubic feet; and the leakage was 4·7 per cent.—a very low figure. Over 15,000 tons of coke were made; and from each ton of coal carbonized 10½ cwt. of coke was sold. The amount of sulphate of ammonia sold was 325 tons, which represented 27·5 lbs. of ammonia obtained from every ton of coal carbonized. About 1370 tons of tar were sold. The sale of the residuals of coal, which cost 10d., brought in the sum of 11d.; so the bye-products had more than paid for all the coal used during the year. The number of ordinary consumers in the borough was 2168; and there were 3984 slot meters issued. This made a total of 6052. Practically every householder in Widnes was a gas consumer. This was a most unusual state of affairs, and did not exist in any other town in the British Isles. The cheap price of gas made everyone use it. While there were only about 39,000 people in Widnes, the amount of gas sold equalled the output in most towns of 80,000 inhabitants. The Widnes Gas-Works were, in proportion to the size of the town, larger than any other in the British Isles. The number of cooking-stoves let out in the town was 635, and the number of slot-meter cooking-stoves 724—making a total of over 1300. The net cost of production per 1000 cubic feet was practically 5d., to which must be added the net cost of distribution, &c., another 1d. Accordingly, the net cost of production and distribution was 6d. per 1000 cubic feet, which price had never been approached by any other undertaking in the British Isles. These results were obtained by the ordinary methods of manufacture, and without the aid of stoking machinery, inclined retorts, &c. It was said that modern stoking methods effected a saving in cost of production. The Engineer was seeing into this, and would possibly come before them some day with a proposal to adopt machinery.

The water undertaking had been very successful; 399 million gallons having been pumped at Stocks Well, and 603 million gallons at Netherley—making a total of over 1000 million gallons. Of this, 658½ million gallons was used by meter consumers, and 343 million gallons for domestic and sanitary purposes. The amount for trade per head per day works out at 51 gallons; and the consumption for domestic use came out at 26 gallons, or a total of practically 78 gallons per head per day This was another most astonishing feature, as the average quantity for towns was 40 gallons per head of the population per day. The result of the year's work was that £1795 of the gas profits and £282 of the water profits had been utilized to the benefit of the town in the form of lighting the streets and in the upkeep of the fire brigade.

After one councillor had advocated some improvement in the public lighting, the minutes were adopted.

Sale of Bristol Gas Company's Stock.—At Bristol, last Thursday week, Messrs. Nichols, Howes, Young, Alder, and Co. offered for sale £20,000 of general capital stock and £10,000 of new debenture stock of the Bristol Gas Company. The sale was conducted by Mr. G. Nichols, who explained that the growth of the Company's business necessitated the issue of new stock. The general stock (5 per cent. maximum) was offered at a minimum of £114 per lot of £100, and the average price realized was £116 4s. 4d. The debenture stock (4 per cent.) was offered at par, and most of it was placed at £103 5s. per £100; the remainder going at £103. The prices realized for both stocks showed an appreciable rise on previous figures.

Romsey Streets Lighted with Fairy Lamps.—Romsey, famous for its ancient abbey, has of late presented a fairy-like appearance at night. The custom for years past has been to leave the public lamps unlighted during the months of June and July; but this year the Town Council were asked to introduce a change by lighting them throughout the year. This they declined to do, and several of the inhabitants illuminated the streets by hanging out Chinese lanterns and fairy lights. The Council took offence at this, and there was a heated discussion. The Deputy-Mayor, referring to the people who had hung out the lights, said their minds were as small as the fairy lamps they had displayed. Eventually the Council decided to fall in with the ratepayers' demands, and, in addition, ordered 40 new incandescent burners.

BURSLEM CORPORATION GAS SUPPLY.

The Results of the Past Year's Working.

At the Meeting of the Burslem Town Council on Thursday week, the balance-sheet of the Gas Committee covering the operations for the past twelve months came up for consideration, as briefly recorded in last week's "JOURNAL."

In moving the adoption of the Committee's minutes, Mr. S. Johnson, the Chairman, went exhaustively into the accounts, explaining all the points of interest. He said the total output of gas during the year was 225,602,000 cubic feet, compared with 228,169,000 cubic feet the previous year. There was therefore a slight decrease of a little under 2 per cent., which was easily accounted for by the amount of property which had become vacant in the borough. They were fortunate that the decrease was not greater. The coal used was 20,613 tons, as against 22,285 tons. The gas made per ton was 10,964 cubic feet, as against 10,261 feet, which showed a very creditable increase, though he hoped that the results in this respect might be even better during the present year. The increase was mainly due to an improvement in the retort-house suggested by the Engineer (Mr. Henry Peaty). This had been more or less of an experiment, and had been applied only to one-half of the retorts in use; but next year it would be applied to the whole of them. He had found that a neighbouring corporation were making 11,692 cubic feet of gas per ton. The loss through leakage in Burslem was still very high—about 9 per cent.; but this figure showed some improvement upon the previous year. In a district like theirs, he supposed they would always suffer more or less through leakage. The total expenses for the year were £25,899, and the receipts were £36,409; so that the gross profits were £10,510. After paying interest on loans, principal, and the contribution to the sinking fund, they were left with a net profit of £3536, as against £127 the year before. This improvement was one of which the Committee were naturally proud, especially as it had been accomplished during a year of great trade depression; and it was the more gratifying when they considered the low price at which gas was supplied. During the year the Committee had been subjected to rather severe criticism; but a glance at the figures in the balance-sheet would probably be sufficient to show that the Committee had carefully studied the interests of the ratepayers. He would point out that the gas undertaking had never cost the ratepayers one penny piece. All they had been asked to do was to pledge the credit of the town for the gas-works. The total cost of the undertaking was £126,371, all of which was borrowed capital; and out of the profits £18,801 had been paid to the sinking fund. Loans repaid amounted to £7854; and the relief to the rates which had been afforded at different times was represented by £52,600. Added to this were surpluses of £12,345, making a total of £91,598 actually provided by the undertaking itself. And they still had an up-to-date works which, if they so desired, they could sell for considerably more than the cost. He could not see how the ratepayers had lost through the management of the gas-works by the Committee. The balance-sheet contained, on the debit side, an item of £2135 paid for rent, rates, and taxes, which was heavy for a concern with a turnover of only £36,409, and seemed to indicate that the undertaking was over-assessed. He questioned whether it was worth while asking for a re-assessment of the works, yet it was only right that the ratepayers should be made aware of the fact that they were getting this sum back indirectly. There had been considerable improvement effected in the fittings department, which the previous year showed a loss. On the present occasion the department showed a profit of £167; and he hoped the improvement would continue. In concluding, he defended the action of the Committee in declining to hand over the surplus to the relief of the rates. On March 31, the Committee had still an overdraft at the bank of £761; and in October next they would have to meet the depreciation in the value of Consols, in which the sinking fund was invested. The extent of this might be between £1200 and £1400. In March, the Consols stood at £18,801, though they had cost £20,604. In addition, they required a working balance to carry them over from quarter to quarter; for though on March 31 the overdraft was only £761, it had risen, by the end of April, to £2080. When they had acquired a trading balance of at least £2000, the Committee would be pleased to hand over any surplus for the relief of the rates, the improvement of the borough, or the reduction of the price of gas. Their first duty was to build up a good working balance and place the concern on a sound commercial basis; and so long as he was connected with the undertaking, he should advocate this policy, whether it was popular or not. He knew a certain class of ratepayers—those who were fond of writing to the papers—would have liked to see £1000 handed over to the rates, even if they had to go to the bank to borrow the money the next day. He hoped that by this time next year they would have got rid of the overdraft, established their trading balance, and have something tangible to offer to the ratepayers as well.

The motion for the confirmation of the minutes having been adopted, Mr. Parkes and Mr. Porter asked that some consideration might be given by the Gas Committee to the users of slot meters. The first-named gentleman said he did not see why slot-meter consumers should be called upon to pay 6d. per 1000 cubic feet more than ordinary consumers or those who used gas for power purposes. There were 5000 slot meters in use; and it was hardly fair that the poor people who used them should have to pay more than those who did not settle their accounts until the end of the month. When the Committee had acquired the working balance of which Mr. Johnson had spoken, he hoped that one of the first things they would do would be to give some concession to the prepayment consumers. Mr. Johnson replied that the slot-meter question was one that had already engaged the consideration of the Committee. He found that out of eight towns the only one which charged as little as 6d. per 1000 cubic feet extra for prepayment meters was Accrington, where the charge was 3s. for them and 2s. 6d. for ordinary meters. He sympathized with Mr. Parkes and Mr. Porter; and if he could have seen his way, he would have recommended a reduction in the charges. There were many additional expenses connected with the use of slot meters; and he calculated that the present difference in price was a fair margin without asking the poorer people to pay more than their share. When the Committee were in a position to make any reduction, the slot-meter users should have first consideration; but at present he thought it inadvisable to interfere with the charges. It should be remembered also that there was no meter-rent.

Mr. Robinson asked how much had been handed to the capital account out of the profits of the works since their purchase. He said that before they could form a proper idea of how the undertaking was progressing, they should know how much money they had actually invested. Large sums had been invested which had been provided out of profits. Until the information he desired was before them, he did not see how the Council could find out what profits they were entitled to from the works as an investment. The £126,000 which had been quoted did not represent the amount of the money invested; and if they earned £10,000 it was not earned simply on £126,000, but on considerably more. He went on to say that the criticism he had to offer was of an entirely friendly character, and without criticism purity in public life was impossible. He had, as every other member had, the utmost confidence in Mr. Johnson as Chairman of the Committee; but he felt certain that all the money was not made at the works that might be made. After citing the results in other towns, he remarked that the gas undertaking was the only profit-earning concern the Corporation possessed; and they ought to get their full profit, to the last farthing, out of it, for the ratepayers were looking to this for the reduction of the rates.

After Mr. Johnson had promised that something should be done to make more widely known the advantages of gas-cookers, the minutes were adopted.

SOUTHPORT GAS SUPPLY.

A Successful Twelve Months' Working.

Mr. John Bond, the Gas Manager to the Southport Corporation, in his first annual report, states that the increased make and sale of gas over the year ending March 31, 1904, was 11,880,000 cubic feet and 12,242,000 cubic feet, or 2·63 per cent. and 2·77 per cent., respectively. Considering the exceptionally bright summer experienced last year, and the comparative mildness of the winter months, he is of opinion that this may be regarded as satisfactory. An increase of 7,917,500 feet of gas, or 37·73 per cent. in the prepayment consumption, was due to the policy of letting out gas-cookers under this system adopted by the Gas Committee in June last. During the year he has rebuilt six beds of through retorts, replacing the brick with clay retorts; the latter being much more economical in building and giving better results in the carbonization of coal. The carburetted water-gas plant has been re-erected on a fresh site, and regenerative settings will be used, giving an increase in the make of gas of 500,000 cubic feet per day. He calls attention to the somewhat heavy capital expenditure, largely due to outlay on gas-cookers, for the purchase of which they are borrowing a further sum of £15,500.

The quantity of gas made during the year was 463,212,000 cubic feet; the increase over last year being 11,880,000 cubic feet, or 2·63 per cent. The make of gas reached a record, as also did the sale of 456,050,100 cubic feet against 350,850,000 feet, and a sale of 334,626,800 feet in 1895. There are now 16,551 meters, against 9224 ten years ago; the prepayment meters numbering 2949, and accounting for much of the increase. During the decade, the lamps have been increased to 2347. There are now in Southport no less than 75¼ miles of gas-mains, and in Birkdale 16¼ miles. The capital account of the works stands at £279,049. The capital expenditure during the past twelve months amounted to £8765—£5305 for cookers (bringing the capital expended on cookers to £21,046); £2331 on meters, which now total £32,609; £563 on mains, which now stand at £51,511; and £565 on buildings. The authorized borrowing powers amount to £312,240, of which £36,137 is yet unraised. In 1904, the net cost of gas was 2s. 0·65d., and in 1905 2s. 0·07d. The cost of manufacture was lowered from 1s. 6·81d. to 1s. 5·84d.; coal being reduced to 10·91d., or a decrease of 20·86 per cent. on the year, and wages on carbonizing and purifying to 2·19d., or 0·45d. less. Distribution has cost 2·65d., or 0·15d. less, and management 1·79d., or 0·25d. more; accounted for by the increased bad debts. There is a slight drop in the income from residuals, chiefly in coke, from 6·66d. to 6·41d. The net profit was £11,473, an increase of £1473 on the year. This is higher than in any year since 1884, except 1895, when the price of gas was 3s. 3d. per 1000 cubic feet, and the profit £16,256, and 1899, when the profit was £15,147, and the price 3s. At present, the price is only 2s. 8d. per 1000 cubic feet.

The New Retort-House Plant at Stockton.—The "Electrical Review" reports that the Gas Committee of the Stockton Corporation "has just completed the installation of new mechanical charging and discharging apparatus, which, with a range of new workshops, has cost the town £9000. All the new machinery is actuated by electricity." Those of our readers who were interested in the illustrated account we recently gave of the new works will know that only the retort charging and discharging machines are electrically driven; the motive power for the coal plant being derived from a Crossley gas-engine, and for the coke plant from a Tangye gas-engine.

Sale of Stock of the Derby Gas Company.—In accordance with the announcement recently made in our advertisement columns, Mr. E. Partridge (of Messrs. J. & W. Heathcote) offered for sale by auction, at the offices of the Derby Gas Company, £8000 of ordinary consolidated stock. The standard dividend on this stock is 5 per cent., subject to the sliding-scale; and the last dividend paid on it was 5½ per cent. The stock was put up in £100 lots, which fetched from £124 to £124 15s. each; the average being £124 8s. 3d. The total premiums realized came to £1953 2s. 6d. The sale was the most successful the Company has had for some years; and the result was an advance of two points (124 to 126) in the 5 per cent. stock.

LINCOLN GAS AND WATER UNDERTAKINGS.

The Past Year's Working—End of the Typhoid Epidemic—The Boring at Boultham.

At the Meeting of the Lincoln City Council last Tuesday week—the MAYOR (Alderman H. Wyatt) in the chair—reports were presented on the work of the municipal undertakings during the past financial year.

The Gas Manager (Mr. J. Carter), in his report, submitted the following figures: Coal gas made, 293,991,000 cubic feet, compared with 293,264,000 cubic feet in 1904; carburetted water gas, 41,089,000 cubic feet, against 46,966,000 cubic feet; making a total of 335,080,000 cubic feet, against 340,230,000 cubic feet. Coal carbonized, 26,957 tons, against 26,558 tons in 1904; oil used, 94,438 gallons, against 108,801 gallons. Gas made per ton of coal, 10,906 cubic feet, against 11,042 cubic feet; oil used per 1000 cubic feet of gas made, 2·29 gallons, against 2·32 gallons; coke sold, including 725 tons used in carburetted water-gas plant, 12,076 tons, against 12,253 tons; coke sold per ton of coal, 8·96 cwt., against 9·23 cwt.; new mains laid, 1 mile 648 yards; new consumers supplied, 155; total number of consumers, 9844. "The outstanding feature of this report," said Mr. Carter, "is the decrease in the quantity of gas made of something over 5 million cubic feet. This is an experience that we share with many other gas undertakings in the country, and in our case it is not surprising having regard to the large increase of 20 millions that we reported last year. At Michaelmas last the reduction of 2d. per 1000 cubic feet in the selling price of gas took effect, involving a loss on the year's revenue of about £1600. Residual products have not realized so well as in the preceding year. The market for surplus coke and tar has weakened considerably, and the returns for these products are accordingly reduced. Notwithstanding these unfavourable features, the surplus profit is, with one single exception, the largest we have realized since the undertaking passed into the hands of the Corporation.

The City Accountant (Mr. J. H. Burgess) reported that the accounts showed that the year's working had resulted in a gross profit of £12,647, compared with £14,191 in 1903-4. From this sum the sinking fund and interest charges have been met, amounting to £7662; leaving a net profit of £4985—a decrease of £1370 compared with the previous year's net profit. He bore out Mr. Carter's remark as to the cause. The net revenue account showed the following figures: Balance at credit, March 31, 1904, £798; add on net profit for year, 1904-5, £4985; total, £5783. From this sum the following appropriations were made during the year: Grants in aid of rates, £3500; new gas-cooking apparatus, £534; extension of mains, £196. The balance of unappropriated profit on March 31 last, was £1553. The balance standing to the credit of the revenue fund account on the corresponding date in 1904 was £13,123; and the interest for the year on the portion of the fund invested amounted to £114; making the total of the fund at the present date £13,237. Of this total £4479 is invested in Bank of England stock, and the balance (£8758) is utilized in providing working capital.

In presenting the accounts, Alderman Wallis said he thought the most satisfactory thing about them was that they showed a profit, after paying £3000 to the rates, of £1500 to carry forward. The gas-works were bought, as they knew, in 1885, and they would find from the accounts that they had paid something like £182,252; so that on the liability side the concern stood at £162,518, while on the asset side it stood at £244,770. Consequently, they had paid off about £82,000, and they had a concern worth nearly £250,000. They were perfectly safe on this side; and it spoke much for the wisdom of the members of the Corporation who acquired the undertaking. At that time coal was just about the same price as now, or there was not more than 6d. or 7d. difference. The price of gas was then 2s. 8d. per 1000 cubic feet. Now it was 2s. 1d. So they had reduced the price by 7d., and had paid considerable sums of money to the rates and made substantial reductions in the amount of capital, which in the course of 25 years would be extinguished altogether. They had also abolished meter-rents; so that there was really a saving to the consumers of £10,865 a year, besides the sum they paid towards the rates. They had also a balance standing at the Treasurer's account of something like £13,000. He remembered the fight for the purchase of the gas undertaking; but no one could now deny the wisdom of the decision they then came to. Mr. W. S. White seconded the motion, and it was carried. Mr. Pennell congratulated the Gas Committee on their extremely able management, and said he felt he was only voicing the opinion of the councillors and the citizens generally when he said they had every reason to be proud of their Manager. It was largely owing to his able and economical management that the concern was such a success.

In the Accountant's report upon the water-works accounts, he said they showed that the year's working had resulted in a gross profit of £7377, compared with £7926 for the year 1903-4. From this sum the following charges had been met: Redemption of debt, £3849; interest and dividends, £2816; special expenses, £498—leaving a net profit of £214, a decrease of £1577 compared with the previous year. The total income for the year amounted to £13,835, compared with £13,585—an increase of £250. The rise in the water-rental, due to the growth of the city, had been again well maintained; the past year's increase amounting to £593. The expenditure showed an increase of £1827. The addition to the working expenses was mainly due to various renewals undertaken; new filter-beds accounting for £658. The balance standing to the net revenue account on March 31, 1904, was £5370; adding this year's net profit there was a total of £5584. From this sum the following appropriations had been made: Grant in aid of rates, £3000; additions to, and extension of, mains, &c., £759; leaving a balance of £1825. The total capital expenditure amounted to £132,567; while the total loan debt upon the undertaking (including the sums borrowed temporarily from the bankers) came to £86,014—leaving a surplus of £46,553. The report was adopted.

At the same meeting, satisfactory statements were made respecting the practical end of the epidemic of typhoid fever in the city; and the Health Committee were congratulated thereon. A statement was also submitted by the Accountant showing the approximate annual cost of the water supply of the city if the Dorrington scheme were adopted, and the financial effect of the scheme. The minutes were passed, and the Council then went into Committee to discuss the water question.

At an adjourned meeting of the Council held the following Friday, the minutes of the meeting just referred to came up for confirmation. They set forth that the members of the Council who attended the conference with the representatives of the Local Government Board, with reference to the question of the best mode of securing a new water supply for the city, reported that they had conferred with Mr. Percy Griffith, their Engineer, as to the bore in progress at Boultham, and had resolved—"That the Council be recommended to continue the 9 feet diameter shaft for a further depth not exceeding 600 feet, at an additional expenditure not exceeding £4000, on the understanding that the work will be carried on continuously, the actual depth to be left to the discretion of the Engineer; and that the Engineer be authorized to prepare in advance the necessary plans and specifications for pumping machinery on the lines suggested by him, with a view to having the work put in hand without loss of time should the water be proved of good quality and of sufficient quantity." They further resolved—"That the Council be recommended to apply to the Local Government Board for their sanction to the borrowing of the sum of £4000, the additional expenditure necessary to continue the shaft as above." Mr. Ruddock, in moving the confirmation of the resolutions, said the Council would remember that the boring implement was lost a little more than a year ago, and a well 9 feet in diameter sunk to a depth of 891 feet. It was then thought that the bad material had been got through; but when the boring was resumed they came across a stratum which was continually falling in. The shaft would be more expeditious. It might not be necessary to go the full 600 feet, and they could discontinue the shafting at any stage on the advice of the Engineer, as the contract was at per foot. When the deputation met the Local Government Board, the Board were inclined to view the Dorrington scheme with favour until the full facts were placed before them, and then they agreed with what the Council proposed doing. From the bore, Mr. Griffith was of opinion that they would get more than a million gallons per day. He thought they would reach the sandstone at the end of the present year, and have the full supply of water by March or April, 1906. If they went to Dorrington, they could not get the water within 18 months at the earliest; and the Boultham scheme was preferable in all respects. The motion was carried.

ELECTRIC LIGHT FAILURE IN THE CITY.

If the City Corporation required any further justification than they have already given for changing from electric lighting to incandescent gas-lamps in certain portions of the City, they had it last Sunday night. Fleet Street is one of the important thoroughfares which is to undergo the change; and Fleet Street was among the sufferers shortly before eleven p.m. on Sunday from a breakdown which occurred at the Bankside generating-station of the City of London Electric Lighting Company. The result was the throwing of Fleet Street and the neighbourhood for some time into partial darkness. Work (says the "Standard") was in full swing at the newspaper offices; and the failure of the electric light (which is now in extensive use) had the effect of impeding operations for nearly half-an-hour. Inquiries at the Company's works elicited no more than that there had been "a serious breakdown," bu that the failure was being remedied. Inconvenience was experienced on the Liverpool Street section of the system as well as in Fleet Street. At Ludgate Hill and eastward in the City, the lighting was imperfect for a time.

GAS AND ELECTRIC LIGHTING—A CHALLENGE.

A comprehensive compilation of facts—not assumptions—concerning the relative value of gas used in incandescent burners and electricity has been printed and circulated among their consumers by the Newquay Gas Company. To a large extent the matter has previously been published in more extended form; but the pamphlet shows what an interesting and useful statement can be laid before consumers if proper selection is made of the points in the information presented to readers week by week. Electric supply in Newquay is still a matter for the future. Unexpected questions have been under consideration by the Local Government Board and the Board of Trade; and this has occasioned such delay that—as the streets must not be interfered with during July, August, and September—supply will not be available until the end of the present year. This is gathered from a letter to the "Newquay Chronicle" by Messrs. Foote and Milne, Limited, who are evidently not over-pleased with the enterprise of the Gas Company in issuing the pamphlet above referred to well in advance of the attack on electricity. Their letter contains two or three amusing parts; the most humorous one being that in which they bravely say they do not propose to reply to the pamphlet in detail, "as the statements made therein are so obviously and ludicrously incorrect that, on the face of them, they bear their own refutation." Do they? The people of Newquay will judge between statements put boldly forward; and Messrs. Foote and Milne who decline to show in what respects they are "obviously and ludicrously incorrect." They are not so obvious that we can see them; and if we cannot see them, the inhabitants of Newquay may be pardoned for not doing so. It is also hinted that the statements are theoretical. We cannot find anything theoretical about the assertions as to the reliability of gas, about the fires that have been due to troubles with electric lighting wires, about the "Lancet" reports, about Professor Frankland's investigations, and about the experiences cited from London and numerous places in the country regarding the comparative costs of electric and gas lighting. These statements are not so "obviously and ludicrously incorrect," nor are their sources of such an unreliable character that the bluff of Messrs. Foote and Milne, Limited, is sufficient to dispose of them. Messrs. Foote and Milne, however, issue a

challenge which presupposes they are going to get a dozen consumers within twelve months in Newquay, and leaves the firm as the challengers to a neat means of escape. They say:

> If, at the expiration of one year from the commencement of the electric supply one consumer out of a dozen, selected haphazard, shall testify and show that, with the same number of lights installed, his electricity bill is larger than his gas bill in the previous year, then we will pay to any local charity selected by the Chairman of the Urban District Council the sum of £100. If this one consumer is not forthcoming, then the Gas Company shall pay a like sum to the charity selected.

"With the same number of lights installed." How beautifully artful. The electric lights may be of 8 or 16 or any other low candle power; whereas each light that the Gas Company, with incandescent gas-burners, would supply would be equal to anything, according to burner and consumption, between (say) 50 and 80 candle power. Messrs. Foote and Milne should attempt to arrange for equality of illuminating power as the basis of their challenge on the head of cost, and not try such an "obvious and ludicrous" evasion of the very purpose of their challenge by suggesting such an indefinite base as "the same number of lights installed," unless they comply with the condition that each electric light shall be of the same illuminating power as the incandescent gas-burners used, and, of course, incandescent gas-burners (which the Gas Company urge their consumers to use, as giving the greatest value for the gas consumed) must have been previously employed to make the result of such a challenge of any value, as a test of the Gas Company's statements.

SHEFFIELD CORPORATION WATER UNDERTAKING.

The Past Year's Working.

We have received from Mr. W. Terrey, the General Manager of the Sheffield Corporation Water Department, the report and statement of accounts for the year ended the 25th of March last. The latter show that the capital expenditure in connection with completed works was increased by £14,793; bringing it up to £2,392,500. The total outlay on the Little Don Valley works, under the Act of 1896, at the close of the financial year was £833,981, compared with £715,564, at the corresponding period of 1904; and on the Rivelin Tunnel works £48,503, against £21,365. The total capital expenditure was brought up to £3,274,984. The income from water-rents was £145,055; and from miscellaneous sources, £5609—together, £150,664, being an increase of £5595, or at the rate of 3·85 per cent. The expenses of maintenance and management being £33,248, the net revenue was £117,416, which was subject to charges for interest and annuities amounting to £90,485; leaving a net profit of £26,931, or a decrease of £2749. The payments to the sinking fund were £12,222; so that the surplus for the year was £14,709, or £4198 less than in 1903-4. The reduced charges to consumers for domestic and trade purposes during the year amounted to £27,220. The value of water supplied to the Health Committee without charge, for street watering, public baths, &c., was £2695; making a total remission for the year of £29,915, being equal to nearly 5d. in the pound on the district rate. The first remission under the Act of 1864 was made in 1898, the amount being £2755; the next year it was £11,109. In 1903, however, it went up to £25,718, and in 1904 to £26,894. The accumulated reserve fund on March 25, 1904, was £125,825; at the corresponding date this year it was £134,119.

Mr. Terrey reports that in the course of the twelve months, 2120 additional houses were supplied; making a total of 98,992. The number of water-closets now supplied is 33,715—an increase of 4136 (including 2042 trough closets, supplying 3842 houses). The increase in the number of baths supplied is 1151, making a total of 11,132. There are 3690 water-meters in use, against 3662. The total domestic and trade supplies on the 25th of March last was 165,242; being an increase of 8003 "new supplies" during the year. The total quantity of water delivered from the works of the Corporation, including statutory compensation water to the Rivers Rivelin, Loxley, and Don, was 7,289,192,557 gallons. Notwithstanding an increase in the sale of water for trade and other purposes by meter, the average daily quantity supplied per head of the population for all purposes was less than in the previous year. This is shown by the following figures: Year 1903-4—meter supply, 1,983,096,530 gallons; total supply, 3,956,204,934 gallons; average rate per head, 23·96 gallons. Year 1904-5—meter supply, 2,062,608,230 gallons; total supply, 4,000,826,327 gallons; average rate per head, 23·77 gallons. In the course of his remarks on the progress of the different works, Mr. Terrey says the work of construction at the Langsett reservoir having advanced sufficiently to permit water to be stored, the valves were formally closed on Oct. 17, 1904, by Alderman Gainsford, the Chairman of the Water Committee, in the presence of a large gathering of representatives of Sheffield, Rotherham, and Doncaster. Since that date water has been impounded to a height of about 90 feet, for the purpose of proving the works. It is anticipated that this work will be completed in the course of the next few months.

Fairburn Water Supply.—The new water supply for the village of Fairburn, near Pontefract, which has been carried out, at a cost of £3000, from plans prepared by Mr. J. Waugh, of Bradford, has lately been formally turned on by Mr. J. T. Addy, the representative of the parish on the Pontefract Rural District Council, who received from Mr. Waugh, as a *souvenir* of the occasion, a silver flask suitably inscribed. The supply is obtained from what are known as the Gadmire Springs, which are leased at a nominal rent from the Wesley Trustees. The flow varies from 150,000 gallons to 1,000,000 gallons per day; and, as Fairburn's population is only 800, the quantity required will absorb only a small proportion of the minimum. The works consist of a reservoir capable of holding 100,000 gallons, a pumping-station, an oil-engine and pumps, and about two miles of mains.

INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACTS.

District Inspectors' Reports—Chief Inspector's Report for Scotland.

In the last number of the "JOURNAL," we noticed the annual report of the Chief Inspector under the Alkali Works Regulation Acts (Mr. R. Forbes Carpenter). We now give extracts from the reports of the District Inspectors, and from Mr. Carpenter's report to the Secretary for Scotland, by which they are followed.

The first district to be noticed is Ireland, which is under the supervision of Mr. E. G. Ballard. The number of works registered is 49, of which 27 are sulphate of ammonia works. More than one registered process is often carried on in the various works needing the supervision of the inspector; so that the total number of processes is 64. There were 167 visits paid, and 149 tests made, last year. Mr. Ballard says the works, on the whole, were carefully conducted; but in some cases those who had charge of the smaller ones had to be reminded of their responsibilities on the score of cleanliness. Two new works were registered during the year; and products equivalent to 2548 tons of sulphate were made. The proportions of liquor distilled by the continuous and intermittent systems were 95·53 and 4·47 per cent. respectively. The proportion of sulphuretted hydrogen treated by various methods, in terms of sulphate made and percentage of the total make, was: Oxide purification, 91·86; retained by lime, 0·91; do. by metallic salts, 6·56; and burnt, 0·67. With regard to works for the distillation of tar, Mr. Ballard says that, taking into account the whole district, there were no cases during the year which caused anxiety; and all seemed desirous to conform to the requirements of the Act, and avoid creating nuisance to their neighbours.

In the North of England (the district under the supervision of Mr. J. W. Young), 58 works produced sulphate of ammonia, and one liquor ammonia. The output from the gas-works was nearly stationary; but the coke-ovens were so busy that the general increase for the district exceeds 8 per cent. The total quantity of gas liquor distilled, in terms of tons of sulphate of ammonia, is 19,278 tons; the proportion distilled by the continuous process being 98·7 per cent. In seven works the Claus process, and in 46 oxide of iron, are used for the destruction of the foul gases. The Claus plant worked well, on the whole, at the works using it. The average acidity of the gases leaving the final towers was 9·2 grains of sulphur trioxide per cubic foot. This is considerably higher than it was a year ago, and is largely due to a few high tests taken when the injection of air to the kilns was excessive. There was little fault to find with the works having oxide purifiers, except in one case. The flue there, conveying the foul gas from the saturator to the purifier, was found, on one visit, to be leaking; but warning given to the owners resulted in prompt attention and remedy. The industry of recovering the bye-products from coke manufacture continues to rapidly increase, especially in Durham. Three new works were started in the course of the year, and five others are being erected. The average acidity of the chimneys into which the final products are draughted was 0·73 grain of sulphur trioxide per cubic foot.

Mr. Ballard has under his care, in addition to Ireland, a large district comprising Cheshire, North Wales, and part of Lancashire. There are 25 sulphate of ammonia works in the district; and, on the whole, they were carefully conducted, though in one or two instances he had to call the proprietors to a sense of their responsibilities. He has nothing new to record with regard to improvements in plant during the year. He had no occasion to find fault with the manner in which works for the distillation of tar were carried on. The arrangements for dealing with the noxious gases were maintained in a good state of repair and working order; and no complaints arose of nuisance from sulphuretted hydrogen, or from vapours from insufficiently cooled pitch. The works, some of which are large, dealing with considerable quantities of tar, were all well conducted.

The district comprising Widnes and Runcorn is under the supervision of Dr. Affleck; and he says that last year there were seven works turning out sulphate and muriate of ammonia—the additional one being the sulphate of ammonia plant belonging to a Mond gas installation. In all of them the manufacturing apparatus of various types is very efficient and was well conducted, giving no trouble or cause for complaint. Of the total sulphate and muriate of ammonia produced by the five works distilling crude ammoniacal liquors during the past year, 16·8 per cent. was made from bone liquor only (giving off no sulphuretted hydrogen) by intermittent distillation, 30·3 per cent. from gas liquor by continuous distillation and using oxide purifiers, 24·3 per cent. from gas liquor by continuous distillation, and burning the sulphuretted hydrogen in a special fire, and 28·6 per cent. from coke-oven liquor by continuous distillation, and taking the sulphuretted hydrogen to pyrites burners. The two Mond gas plants now turn out about 60 per cent. of the total liquor made in the district.

Mr. H. Porter has charge of a district comprising North and East Lancashire and part of Yorkshire, in which there are ten works where liquor ammonia is produced, and 44 for the production of sulphate of ammonia; being two more of the latter than last year. The total quantity of liquor distilled to sulphate was 20,622 tons, 96·45 per cent. of it being treated by the continuous process. The method of dealing with the sulphuretted hydrogen is mostly by absorption by oxide of iron or lime—in the case of the former, to the extent of 56·13 per cent. of the liquor distilled. At one works the whole of the sulphuretted hydrogen is converted into vitriol by burning in the oxide burners. The Claus process continues to be successfully operated at several gas-works, converting the sulphuretted hydrogen into sulphur, for which there is a ready demand. At two works the oxide purifiers are revivified *in situ* for an hour or two at a time; otherwise the vessels become too hot. Mr. Porter has nothing fresh to report in the construction or the working of this kind of plant; and there were no infractions of the law during the year due to foul purifiers or escapes from Claus plant. The general condition of the tar-works was satisfactory.

In the East Midland district, Mr. E. Morley Fletcher reports

continued extension of the erection of coke-ovens, with the recovery of bye-products. One works was registered at the beginning of the year, and also a sulphate plant erected at a gas-works. In both cases the saturator gases are dealt with in oxide of iron. In connection with one sulphate plant, the purifiers have been replaced by two oxide of iron heaps. These are levelled and spread out on alternate days to revivify; and Mr. Fletcher says they prove very satisfactory—much labour in emptying and refilling being dispensed with. The total amount of ammoniacal products manufactured last year, given in terms of sulphate of ammonia, was 16,196 tons. At the time of writing his report, the fatality occurred at the Batley Corporation Gas-Works, whereby the Manager and a workman lost their lives. Mr. Fletcher gives the following particulars in regard to the occurrence:—

> Here there are two purifiers in connection with the sulphate plant, worked alternately. Screw-down valves are used, and between each valve and purifier there is an opening in the gas-main covered by a removable plate. When a purifier is not in use, the plate is removed, so as to allow a current of air to pass through the oxide by natural draught, and so partially revivify *in situ*. Apparently a man was sent to change the purifiers, and in error removed the covering plate over the aperture in the gas-main to the working purifier before closing the valve, and so received a fatal dose of sulphuretted hydrogen. The Manager, probably in attempting to remove the man from danger, was overcome also; and, not being missed for some time, both were beyond help when found.

The quantity of liquor distilled (equivalent to sulphate) last year was 19,760 tons, compared with 18,646 tons in 1903; the number of works using the continuous process being one more than in 1903.

In the South Midland District, Mr. E. Jackson reports an addition of eight works for the manufacture of sulphate of ammonia last year—bringing up to 95 the total registrations for works of this class; and he gives some particulars in regard to them. The total quantity of liquor distilled, expressed as sulphate, was 30,600 tons; the number of works using the continuous process being 85, and the proportion of liquor distilled 97·5 per cent. Plants for dealing with the sulphuretted hydrogen by burning, and arresting the resulting sulphurous acid in limestone and water towers, are now in operation at three sulphate of ammonia works in the district. Mr. Jackson says the working of these plants gave cause for some anxiety during the year, on account of the irregularity in the escape of sulphurous acid from the towers into the chimneys. He remarks that the chemistry of the process is so extremely simple that at first sight it might appear that difficulties would not be likely to occur; but in actual operation it has been found that there are numerous points at which the working may go wrong without such supervision. He points out that the process is essentially a chemical one, and unless there is a chemist who can watch the towers, and take tests during a run with the plant, from experience with the apparatus as erected in the district, excessive escapes may continue unchecked without anyone in the works knowing it. Among some of the points which have to be closely watched he mentions the following: (1) Water supply on the condensers, so as to completely dry the saturatory gases before entering the furnace, or only partial combustion of the sulphuretted hydrogen takes place. (2) Coke fire to be well looked after, for the same reason. (3) Proper adjustment of the air in the furnace, to secure complete oxidation of the sulphuretted hydrogen. (4) Water supply on the towers frequently examined, to ensure equal distribution, as well as ample supply, which is a most important point for successful working. It is also essential after each run with the plant, and at once when the tests show the escape to be rising, that the towers should be opened and the limestones examined, rearranged, and renewed where necessary. It was arranged by the managers at two of these works, and a promise was extracted from the manager of the remaining one, that chemical supervision should be given and tests taken during the working of the plants. In this way the process was made to work satisfactorily, and the tests of the final escape from the plants at the close of the year were much improved. There are 24 tar-works now registered in Mr. Jackson's district; being one more than last year. The addition is a small works with one still only, for the manufacture of "prepared tar." The plants generally at the various works were kept in good repair; and there was no change to report in the methods adopted for arresting the offensive vapours, though in several cases improvements were made in carrying out the method.

In the South-West of England and South Wales district, there are, according to the report of Dr. A. C. Fryer, 74 works registered where the manufacture of sulphate and muriate of ammonia is carried on; and the total quantity of ammoniacal compounds produced during the year amounted to 10,438 tons, calculated as sulphate of ammonia. Of the total bulk of liquor distilled, 91 per cent. was treated by the continuous process. Dr. Fryer recalls the fact that as long ago as 1897 he pointed out that the Coppée ovens were in use for the coal coked at several of the large iron-works in South Wales; and the volatile matter, excluding water, had been estimated to be about 17 per cent. Yet no serious attempt had been made to recover the bye-products. On that occasion he quoted the words of the Chief Inspector, who remarked: "A change may, however, be effected, as, by the introduction of coal-washing machinery, the conditions are now so much modified that the opinion is gaining ground that the air admitted in the Coppée oven may be dispensed with without injury to the resulting coke, in which event plant would soon be added for the recovery of tar and ammonia." Dr. Fryer says the recovery of the bye-products from the coke-ovens in South Wales is a problem which has lain dormant for several years, and the first large company to undertake the erection of the necessary plant is the Great Western Colliery Company, Limited, at their works at Pontypridd. This plant was registered in the early part of the year, and has been in operation for some months. Several complaints were made last year against the sulphate of ammonia plant belonging to the Dorchester Gas Company. It was, however, difficult to believe that this plant was a source of nuisance, as it was always found to be working satisfactorily when it was visited; and though some of the complaints were preferred when the plant was actually not in operation, it was nevertheless considered desirable to remove the oxide of iron purifier from a position it occupied near some cottages to a situation farther removed from dwelling-houses.

The report of Mr. Napier Sutton on the Eastern and South-Eastern Counties is always an interesting contribution to the series of reports by the District Inspectors. Five new works were registered last year; three of them being sulphate of ammonia works, and one for tar distillation. The number of visits of inspection made to registered works in the course of the year was 622; and the number of tests made of gases escaping from chimneys, flues, and process plants was 686. No complaint was received against any registered works for the discharge of noxious gases or nuisance of any kind. Of the 90 works registered for the manufacture of sulphate of ammonia, all but one were in operation last year. The total quantity of ammoniacal compounds manufactured amounted to 48,113 tons, calculated in terms of sulphate of ammonia—a decrease of 9 tons on the amount made in 1903. The products manufactured consisted mainly of sulphate; but considerable quantities of carbonate, nitrate, and oxalate of ammonia, liquid (refined), and anhydrous ammonia were also made. All products were obtained from the distillation of coal, with the exception of a few hundred tons derived from the carbonization of bone in the manufacture of animal charcoal. There was little alteration in the type of plant employed or in the methods used for the disposal of the foul saturator gases. The proportion of ammoniacal liquor distilled by the continuous process remained as in the previous year—98·8 per cent. The gas-works belonging to companies and local authorities made 88·4 per cent. of the products, and the rest came from private firms. Absorption of the sulphur compounds by oxide of iron is necessarily in most general use, as being particularly convenient at the smaller works. Though this method is employed at 58 works, the proportion of gas so treated only amounts to 9·2 per cent. of the whole. The use of oxide heap purifiers in lieu of the open box form has extended; and, where properly constructed concrete floors are provided for the heaps, Mr. Sutton says the method is "satisfactory and very economical in material and labour." This form of purifier is in use at seven works, either alone or in conjunction with the ordinary form of open purifier where these are taxed in capacity. As in his previous report, Mr. Sutton gives some particulars of the "combustion neutralization" method for the disposal of the sulphuretted hydrogen, which has been further extended, and is now used at nine works. With one exception, the plants are capable of yielding a high and satisfactory percentage neutralization. The average results shown in the following table are not so good as those for the preceding year, and are greatly reduced by the poor returns made at the second and fourth works in the table, both of which should, Mr. Sutton says, show much improvement in the near future.

Average Neutralization Effected.				Results Obtained with Neutralizing Plant Working at Highest Efficiency.			
Acidity of Furnace Gases.	Acidity of Gases leaving Washer-Condenser.	Acidity of Gases leaving Lime-stone Scrubber for Chimney.	Per-centage of Acid Removed and Neu-tralized.	Acidity of Furnace Gases.	Acidity of Gases leaving Washer-Condenser.	Acidity of Gases leaving Lime-stone Scrubber for Chimney.	Per-centage of Acid Removed and Neu-tralized.
Grs. SO_3.	Grs. SO_3.	Grs. SO_3		Grs. SO_3.	Grs. SO_3.	Grs. SO_3.	
58·50	..	3·26	94·10	51·00	42·00	0·10	99·80
31·68	4·07	4·70	82·96	45·00	9·35	1·19	95·60
6·17	4·20	0·15	97·51	5·60	4·20	0·10	98·19
22·25	6·90	5·43	67·72	22·50	15·00	4·80	72·90
49·15	4·45	0·50	98·18	63·85	4·20	0·10	99·85
66·17	14·79	1·95	96·97	57·50	13·50	0·15	99·74
39·11	17·05	1·05	97·25	51·00	20·60	0·15	99·71
39·00	11·91	2·43	93·77	42·35	15·55	1·04	97·54

At two works the saturator gases are passed to the hydraulic main or the foul main, and so to the coal-gas purification plant. It is a matter of individual preference, but the method cannot offer any advantage over the use of the special purifier usually attached to the sulphate plant. Mr. Sutton reports a further reduction both in the number of works and the quantity of gas dealt with by the unsatisfactory method of combustion in retort or boiler fire flues. Four of the works are very small; and only at one large works, situated in a very isolated position, is the gas burnt in a specially-designed furnace, and the resulting sulphur dioxide discharged into the chimney. A lamentable fatality occurred at the works of the Faversham Gas Company in December last. The sulphate of ammonia plant was in process of heating up prior to starting the distillation of liquor when the still column exploded, wrecking the plant and injuring two men, one of whom subsequently succumbed through shock and burns. The plant consisted of a still column with two intermittent liming boilers; the steam entering the plant by the latter, and travelling through the system under regulation of mercury gauges fitted to the liming boilers. The explosion appears to have been caused by excessive steam pressure due to a blockage in the ammonia pipe between the column and the saturator. After the explosion, the mercury gauge cocks on the liming boiler were found closed, and the steam inlet-pipes fully open, which would allow the full pressure of between 50 and 60 lbs. from the works boiler to be exerted upon the liming boiler and still column. One very small tar-works was added to the registered list last year; making 19 works at which the distillation of coal tar is carried on. The total plant employed remains much as hitherto—viz., 109 intermittent pot stills and three of Lennard's patent continuous stills. Arrangements for collecting and destroying the permanent still gases exist at all the works; and they were generally found in effective condition.

We now come to the Chief Inspector's report to the Secretary for Scotland (the Marquis of Linlithgow), which, as usual, includes one by Mr. W. S. Curphey, the District Inspector. The number of works in Scotland registered under the Alkali Acts on the 31st of December last was 133, or six more than in the preceding year; while the processes under inspection numbered 214, compared with 208 in 1903. In the course of inspection, 458 visits were paid, and 479 examinations made of the gases passing away from the various works. The general average figures are higher than the corresponding results obtained in 1903; but the quantities are well within the prescribed limits, and the means for preventing the undue escape of noxious gases were maintained in an

efficient condition. In a tabular statement showing the quantities of raw materials used and the products derived therefrom, Mr. Curphey gives the following figures in regard to sulphate of ammonia: Gas-liquor works, 16,685 tons; iron-works, 19,066 tons; shale-works, 42,486 tons; producer gas, coke, and carbonizing works, 4760 tons—total, 83,307 tons, compared with 75,781 tons in 1903. The number of registered works in which sulphate, chloride, or hydrate of ammonia was made during the past year was 75, or six more than in 1903. They comprised 16 iron-works, 12 shale-works, 7 coke, producer gas, and carbonizing works, and 40 gas-liquor works. Although the number of works utilizing liquor is increased, the gross production is but little altered. The practice is still extending of erecting plant in gas-works, where the gas liquor is used at the place of its formation to produce sulphate of ammonia as a marketable product, instead of sending the liquor to centrally situated works, where the combined production from many gas-works is treated. In this way the expense of railway carriage is avoided; but, of course, many smaller manufacturing plants have to be put into operation instead of a few larger ones. The proportion of liquor distilled by the continuous process last year was 98 per cent. of the entire bulk. The production of sulphate of ammonia from shale-works shows a decided increase (from 37,353 tons to 42,486 tons); while the extended use of gas-producers fitted with ammonia-recovery plant, and of coke-ovens provided with plant for the recovery of tar and ammonia has resulted in an increased production from both of these sources.

Mr. Curphey states that in works utilizing gas liquor, the use of the oxide of iron purifier is most general; but in four works the combustion method of destroying sulphuretted hydrogen is continued. In three of these oxide of iron purifiers are also employed, and a portion of the waste gases is treated by each method; local exigencies having prevented the provision of sufficiently large purifiers to deal with the entire quantity. In the remaining works, a small sulphate of ammonia plant has been erected in a large engineering factory. The conditions existing in this case are quite exceptional, as the excessive dilution of the burnt waste gases before they reach the atmosphere reduces the increased acidity of the chimney gases to a very small quantity indeed.

Towards the close of the report, the Chief Inspector makes the following remarks on the production of sulphate of ammonia:—

As is also the case in England and Ireland, the manufacture of sulphate of ammonia contributes more largely than any other to the list of chemical operations scheduled under the Alkali Acts; the proportion to the total reaching one-third when the combined manufactures of sulphate and muriate together with liquor ammonia are considered. Moreover, Scotland contributes one-third of the total to the figure of ammonia (recovered in various forms, but calculated as sulphate) produced in Great Britain and Ireland. On reference to the table in my report to the Local Government Board [see *ante*, p. 794], and to the remarks which follow, it will be seen that the recovery of ammonia in shale distillation is an industry entirely confined to Scotland, and that from this one-sixth of the total produce of the United Kingdom is derived. The increase in production from this source in 1904—5130 tons—is more notable than in any previous year, with the exception of 1895, when the figures showed an increase over those of 1894 of 5300 tons. As has been mentioned in recent reports, the new retorts, of various types in regard to detail of construction, are of much larger capacity than the old Pentland retort, in respect both of height and of sectional area. Increased tonnage of shale is put through at all the works on a minimum of ground space, and with a minimum of labour charges for handling. It is usually the case that the shales that are richer in yield of oils have a less nitrogen content recoverable as ammonia, and *vice versâ*. The characteristics of the various shale seams are now well known. I have compiled the table below by aid of the statistical returns on Mines and Quarries issued by the Home Office:—

Year.	Total Shale Mined in the United Kingdom.*	Total Sulphate of Ammonia Recovered from the Shale.	Yield in Pounds per Ton of Shale Mined.
1895	2,246,865	38,355	38
1896	2,419,525	37,822	35
1897	2,223,745	37,153	37
1898	2,137,993	37,264	39
1899	2,210,824	38,780	39
1900	2,282,221	37,267	37
1901	2,354,356	40,011	38
1902	2,107,534	36,931	39
1903	2,009,602	37,353	42
1904	2,333,062	42,486	41

* A certain amount of shale is used in gas-works in place of cannel for raising the illuminating value of gas.

I think it may be said that in 1903 the influence of the new retorts must have made itself felt, for good or ill, on the produce of ammonia, even if the uncertainties as to the operation of other factors noted above be taken into account. It would seem, therefore, that no diminution in the yield of ammonia per ton of shale need be anticipated, but rather some increase. As regards the yield of ammonia in the manufacture of illuminating gas, the figure remains stationary, and does not show sign of approaching again the maximum of 18,200 tons in 1902. The manufacture of carburetted water gas from coke, in which no ammonia is produced, tends to increase as an adjunct to the supply of coal gas proper, so that a check on increase in the amount of coal distilled is likely to continue to be experienced. The amount of ammonia recovered from blast-furnaces in Scotland now exceeds that from gas-works.

Mr. Carpenter gives the following particulars which Mr. A. Gillespie allowed him to publish in regard to the provision made for cooling and condensing the gases at one modern works, where the calculations were made for six furnaces being regularly in blast. After leaving the tar-washer, a horizontal vessel 64 feet long and 16 feet wide, "the partially cooled and cleaned gas passes by an 8-feet diameter pipe to the condensers. These consist of twelve sections, each formed as a complete condenser with cast-iron chest and vertical pipes, but all connected to a common inlet and outlet main. Each chest is 54 feet long, 5 feet wide, and 3 ft. 6 in. deep, and fitted with 18 pairs of vertical wrought-iron pipes 54 feet high and 20 inches in diameter, making in all about 4½ miles of 20-inch piping." The gases, cooled to 70° Fahr., or less, pass thence to the exhausters (the total capacity of the three sets of which is equal to about 2¾ million cubic feet per hour), and are impelled to two ammonia washers, each 60 feet long by 12 ft. 6 in. wide, similar in design to the tar-washer. In February last, Mr. J. Gillespie contributed to the West of Scotland Iron and Steel Institute some "Notes on the Evolution of Blast-Furnace Recovery Plant," from which Mr. Carpenter notes that "in the condensers at the Coltness Iron-Works there are over 6¼ miles of 20-inch vertical pipes." In these works the situation of the plant on elevated ground, well open to the play of wind from every direction, is exceptionally favourable for the attainment of low temperatures before the ammonia washer. In this case, as in that of nearly all these atmospheric condensers, an arrangement for spraying water over the tubes is added. Eight furnaces are usually in blast. The turbine exhauster has been introduced, and has proved very successful. Each of the three erected has a duty of 28,000 cubic feet per minute at a pressure of 28 inches of water—that is, 20 inches suction and 8 inches of pressure; but the machine is actually doing more work than this. The speed is about 7500 revolutions per minute.

In his report for 1900, Mr. Carpenter devoted some space to a record of the progress made in the development of gas-engines of large size, and in their application to the utilization of the power of blast-furnace gases; and he mentioned that in Scotland, as compared with blast-furnaces where coke is the fuel used, the gases coming from the tar and ammonia recovery plant were "in the best possible condition for use directly in the gas-engines, being freed from water vapour, dust, and tar, as far as the elaborate scrubbing plant of ammonia recovery can accomplish it." He now states that in November last, the first gas-engine of large size commenced running on duty for the compression of blast. It is of the Seraing or Société Cockerill type, built on the well-known Delamare-Debouteville patents. Naturally considerable interest attaches to the features of working such an engine with gases of the above-mentioned type. He adds that the gases are derived from the works where the condensing plant described by Mr. A. Gillespie is in use; and after leaving the ammonia washers the return gases travel for several hundred yards the entire length of the recovery and blast-furnace plants to the gas-engine house, outside which further tar interception plant was fixed. At this point, 12 gallons of tar emulsion are collected per million cubic feet of gas. It contains 0·7 gramme (10·8 grains) of ash per 1000 cubic feet of gas; yet white filter-paper held for many seconds in face of a jet of the gas did not give any brown stain. Mr. Carpenter says that the apprehensions as regards possible pre-ignition of the charge by incandescent ash may be disregarded as possessing much importance, since the mineral matter introduced into the cylinder by the lubricant used would be of greater moment than this. The engine was at that time compressing air for blast at about 6½ lbs. pressure. In the course of his report, Mr. Curphey mentioned an increase in the number of coke-oven works, and in those where producer-gas manufacture is accompanied by ammonia recovery. The Chief Inspector states that in one of the latter the principal use for the gas will be for the production of electrical energy for the supply of power in a large shipbuilding yard. Here one gas-engine of 1000-horse power, of the Oechelhaeuser type, has been built. There is a cylinder with open ends provided with two pistons moving in opposite directions, the charge being compressed by their approach on the return stroke. A fresh impulse is therefore given, by explosion, on every revolution of the shaft. Mr. Carpenter points out that engines of this type have been in operation for some time at Hörde, where, after overcoming many obstacles, sufficient success appears, he says, to have been attained to justify extension of the system elsewhere.

Fatal Accident in the Provan Gas-Works.—On Friday last, a man named M'Ewan, 60 years of age, sustained serious injuries in the Provan Gas-Works, Glasgow. While taking off the clogs he wore when working, one of the stoking machines struck him, knocking him into a coke-shoot, and causing him shocking injuries. He was at once taken to the Royal Infirmary, where he died of his injuries the following morning.

Shrewsbury Water Supply.—At the meeting of the Shrewsbury Town Council yesterday, a long report by Mr. G. R. Strachan, M.Inst.C.E., on his river scheme for supplying the borough with water, was presented. If certain conditions which he prescribes are observed, he considers that the river water can be used with absolute safety, and that it can be supplied to the town at a cost of £60,000 less in capital charges than the upland scheme. It will, however, necessitate an expenditure of £1350 per annum more than that scheme for working expenses. Of the three sites suggested by Mr. Strachan, the Water Committee think the one at Sharpstone Hill the most suitable for the service reservoir; and they propose that they should be authorized to further investigate this scheme.

A Woman's Impressions of Gas Making.—The Engineer and Manager of the Norwich Gas-Works of the British Gaslight Company (Mr. Thomas Glover) is always willing to enlighten his fellow-citizens on the subject of gas making; and accordingly he was engaged in a congenial occupation when he and three of his assistants conducted a party of 115 members of the Educational Department of the Norwich Co-operative Society over his new works on a recent Saturday afternoon. An account of the visit is given by a lady member in the May issue of the "Monthly Herald" of the Society; and it is pleasing to find that she confesses that gas is a "great boon" to a woman. For years she had the idea that gas-cookers were unhealthy; and in the summer time she found cooking very distressing: but "with the great improvements made in them they are now the perfection of stoves, and suitable for any kind of cooking." As she points out, much of a woman's work is unproductive; and therefore any invention that will lighten it should have the eager attention of the sex. She closes her story by saying that when she is lighting her gas she will breathe a good wish upon the men who, by their hard work, help to make hers easier, and life generally more pleasant.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the commercial columns of the "Glasgow Herald" last Wednesday, under date of Tuesday, the following announcement was made: "The Glasgow Corporation Gas Committee to-day recommended the acceptance of tenders for the supply of coal for gas-making purposes, for delivery during the ensuing season. Fully 700,000 tons have been purchased, while the total quantity offered amounted to between two-and-a-half and three million tons. From the coalmasters' point of view, prices for these contracts are not satisfactory; the Corporation having, in all cases, been able to buy at slightly less than a year ago, when, moreover, the supplies were bought at under the contracts fixed in 1903. On this occasion, no offers at last season's prices have been accepted; and one or two companies which have for many years supplied large quantities, have had their offers rejected on the score of price. No first-class cannels or Fife shales have been bought on this occasion. A year ago a considerable quantity of these descriptions was taken, including 20,000 tons of cannels from the Lothians, and several lots of 10,000 to 20,000 tons of Fife shales. The Corporation will, however, again take a fair quantity of second and third class cannels; and once more a line of about 40,000 tons has gone to Ayrshire. Prices, however, show a reduction of from 3d. to 6d. per ton on those of a year ago. Somewhat larger quantities than usual of coking coals have been purchased; the total amounting to between 120,000 and 130,000 tons, also at a reduction of from 3d. to 6d. per ton on the expiring contracts. The balance has been made up principally of ells and splints, in lots of 5000 to 50,000 tons; a larger quantity than usual having been taken of the former, and rather less of the latter. The prices of both these descriptions are from 1d. to 3d. per ton less than the Corporation paid a year ago, when, in turn, prices were from 3d. to 6d. per ton below those of 1903. Indeed, the current year's prices mean even less to some coalmasters than is indicated. Hitherto prices were fixed on the basis of delivery to the nearest station to Dalmarnock; but as the gas-works there have been closed, delivery is to the new works at Provan, which, to some coalmasters (especially to those on the Caledonian Railway system) represents 2d. per ton more for carriage, and therefore 2d. per ton less at the pit." The quantity purchased—fully 700,000 tons—is not quite up to what was contracted for in either of the past two years. A year ago it was between 700,000 and 800,000 tons; and in 1903 it was no less than 710,500 tons.

I mentioned last week that the Town Council of Glasgow was counted out while considering a proposal as to the readjustment of the provisions for the lighting of common stairs and private streets. The subject was again before the Town Council on Thursday of this week. Mr. W. F. Anderson explained that he was sorry that he found it necessary, at a late period of the previous sitting, to ask that the house be counted. None of them objected to the improvement of stair lighting. The out come, however, would be an increase in the rates of fully £2000—equal to ¼d. He moved that the minute be remitted to the Watching and Lighting Committee, with instructions that upon the earliest occasion they should apply to Parliament for power to alter the price they were permitted to charge landlords for gas. This charge—10s. per burner—was fixed forty years ago. Bailie O'Hare, in support of the minute, said that the lighting in many of the lower districts of the city was a disgrace. On a show of hands, Mr. Anderson's proposal was carried by twenty-one votes to eleven.

On Wednesday of last week, an extensive reconstruction of the Corporation Gas-Works at Campbeltown was formally opened. The Town Council, when they resolved upon the work, consulted Messrs. A. Gillespie and Son, of Glasgow, and followed their advice throughout. The old retort-house, which was small, and in other respects unsuitable, has been abandoned, and a new house built on more commodious lines. The retort-bench contains six ovens, of fives. New condensers, and a new purifier-house, have been erected, as well as new offices, meter-house, governor-house, photometer-room, and lavatory. The other parts of the plant have not been interfered with. The cost of the work has been about £5000. The ceremony of opening consisted of Provost Mitchell charging one of the retorts. This, it was explained by Mr. John Gillespie, who represented the firm of Engineers, was in reality the first making of gas in the works. At a cake and wine banquet which followed, Provost Mitchell said that it was now twenty years since the last big extension was made to the works. In 1882, the quantity of gas made was 11,688,000 cubic feet; while in the year 1904-5, it amounted to 23,148,000 cubic feet. The price in 1882 was 5s. 10d. per 1000 cubic feet; it was now 4s. 2d. They had 140 prepayment meters in use, and last year the revenue collected from them, mostly in coppers, was £537. The new plant was capable of producing three times the quantity of gas which is being made at present. He proposed the health of the Contractors, coupled with the name of the Engineer. Mr. J. Gillespie, in responding, expressed regret that his father was not present. He testified to the pleasure it had been to his firm to work along with the officials of the Corporation, including the Gas Manager—Mr. D. Currie—who had rendered them every assistance in his power.

At the meeting of the Kilsyth Gas Commissioners on Monday, Colonel Freer, the Convener, gave in the annual report of the Committee. He said that during the year they had carbonized 2500 tons of coal, and the yield of gas was 22¼ million cubic feet. The unaccounted-for gas had been reduced from 24 to 12 per cent., which was largely due to the introduction of new piping and meters. The average yield of gas per ton of coal was 9800 cubic feet; and the increase in the consumption was over a million cubic feet. There were 986 meters in use, and they had hired out 90 cooking-stoves. During the past three years, they had reduced the price of gas from 4s. 2d. to 2s. 11d. per 1000 cubic feet—being a reduction of 5d. each year; and he was glad to be able to recommend a further reduction of 2d. per 1000 cubic feet to

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ordinary consumers, and of 4d. to manufacturers or those who used gas for other than domestic purposes. The Council, after discussion, resolved to reduce the price of gas by 2½d.—making it 2s. 8½d. per 1000 cubic feet.

The Grangemouth Town Council had before them on Monday a minute in regard to the proposed purchase of the undertaking of the Gas Company. In it was submitted a report by the Town Clerk, to the effect that the Directors of the Company desired to have an official communication as to the information desired regarding the gas-works, in order that they might consider it; and he also reported as to what had passed between him and the Secretary of the Gas Company on the subject. The Clerk was instructed to write to the Company and ask them for a copy of their last balance-sheet, and for a statement to show, during the last five years, the Company's earnings, the gas produced, the gas sold, the percentage of leakage, and the oncost, so far as this information was available; and also to inquire whether, in the event of a purchase, the Company would require the Town Council to buy the whole of the heritable property belonging to the Company, and whether they could give an approximate idea of what price they expected to get. The Clerk was also instructed to obtain some information regarding the purchase of gas undertakings by other burghs. The Council had before them the subject of the public lighting of the burgh; and they agreed to a very large extension of the system of incandescent gas lighting.

The Blantyre Gas Company have raised a question as to the right of the Corporation of Hamilton to supply gas within a portion of the parish of Blantyre. This was reported to the Hamilton Town Council on Tuesday by the Gas Committee, who stated that they had held a meeting that day to consider the protest of the Blantyre Company. To the letter of the Company, the joint Town Clerks of Hamilton had replied asking them if they had any statutory authority for their position; and the reply had been received that the Company claimed protection under the Sale of Gas Acts and under the Burghs Gas Supply Acts. The Council agreed that the Town Clerks should write to the District Committee of the County Council asking for direct authority to supply gas. The Gas Committee were advised that the Corporation had power to supply gas in the parish of Blantyre, and that the Blantyre Gas Company had no statutory authority, and were not protected by the Burghs Gas Supply Acts. The Town Clerks were instructed to write to the Company to this effect, as well as to write to the Engineers for the County Council, asking them to undertake all liability. They also asked power to proceed with the work. This was agreed to.

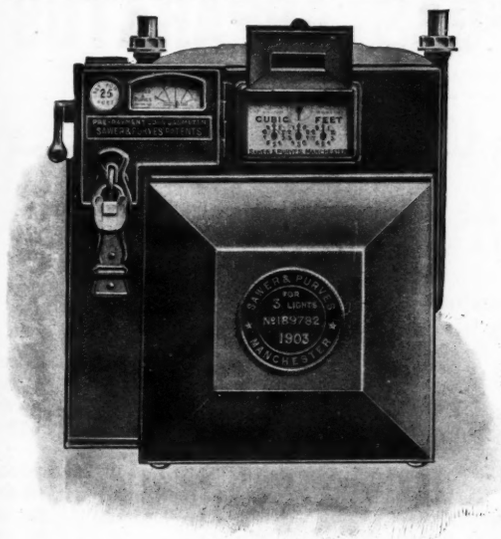
The Corporation of Wishaw have recently come to the resolution to abolish meter-rents.

The annual meeting of the Carluke Gas Company was held at the offices on Monday. It was reported by the Directors that during the year ending April 30, the quantity of gas sold was 13,255,500 cubic feet, which was an increase of 543,500 feet over the preceding year. The income was £2604, and the expenditure £1897; leaving a balance of £707. It was agreed to pay a dividend at the rate of 10 per cent., absorbing £500, and to carry the balance to the reserve fund. At the meeting of the Dalbeattie Gaslight Company, it was reported that the consumption increased during the year by 605,000 cubic feet, and that there was a surplus on the accounts of £114. A dividend at the rate of 5 per cent., with 1 per cent. of a bonus, was declared. The Leven (Fife) Gas Company have paid a dividend at the rate of 7½ per cent. During the year the works were largely extended, under the supervision of the Manager—Mr. P. L. Readdie.

The quantity of gas manufactured in the Peterhead Corporation Gas-Works during the past year amounted to 35,769,000 cubic feet, which was an increase of 2,672,300 feet over the preceding year.

Great things are being said of the Arbroath Corporation Gas-Works. At the Town Council meeting on Monday, it was reported that during the year ending May 15 the quantity of gas manufactured amounted to 81,536,000 cubic feet, which was an increase over the previous year of 4,156,400 feet. The gas made per ton of coal amounted to 9500 cubic feet—an increase upon the previous year of 430 cubic feet. The quantity of gas sold was 73,443,313 cubic feet—an increase of 3,317,632 feet. The amount received for gas was £11,838—a decrease of £896. (The price of gas was reduced by 5d. per 1000 cubic feet last September.) The amount received for gas sold by ordinary meter showed a decrease of £1438, while the sum received through prepayment meters showed an increase of £542. The quantity of gas sold to ordinary consumers was 62,187,963 cubic feet—a decrease of 8718 cubic feet. The gas sold through prepayment meters amounted to 11,255,350 cubic feet—an increase of 3,326,350 feet. Allowing for 1,590,006 cubic feet of gas consumed on the works, there remained 6,502,681 feet unaccounted for, which was equal to 7·90 per cent.—an increase over the previous year of 0·52 per cent. There are now 4215 ordinary and 1709 prepayment meters in use; being a decrease of 299 ordinary, and an increase of 426 prepayment meters during the year. There is sufficient surplus on the gas accounts to pay the entire expenses of the abortive Electric Lighting Order, amounting to £1140, and to carry forward £301. This is after meeting all ordinary charges, and providing £1500 for the sinking fund and suspense account. Mr. Robbin, the Convener of the Gas Committee, in moving the adoption of the minutes of the Committee, said that the reductions in the price of gas during the past two years had meant a saving of £2496 to the gas consumers. The wiping out of the expenses of the Electric Lighting Order meant a saving to the ratepayers of from 3d. to 4d. per pound. The minutes were adopted.

At a recent gas exhibition at Bognor, Mr. W. Edgar, of Hammersmith, had an excellent display of both indoor and outdoor lighting appliances. The hall was effectively lighted by his "Eclipse" and "King" lamps ranged up the centre, and the entrance to the arcade by outdoor arc lamps of this kind. A device consisting of a star in the centre, "E.R." at the sides, and "Gas Exhibition" beneath, was lighted by small gas-jets. Opposite the main entrance to the hall there was fitted one of Mr. Edgar's incandescent self-intensifying street-lamps of 1000-candle power.



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CURRENT SALES OF GAS PRODUCTS.

Week ending June 17.

The London pitch market shows little alteration. Considerable quantities have been sold; and the tendency of prices is now upward. Benzol and carbolic crystals maintain their position. In sulphate of ammonia, little interest is shown; but the article is steady—the quotation being £12 16s. 3d. on Beckton terms.

LIVERPOOL, *June* 17.

Sulphate of Ammonia.

There has been a holiday character about the market, but available supplies are in limited compass and prices have been about maintained. The closing quotations are £12 10s. per ton f.o.b. Hull, and £12 16s. 3d. to £12 17s. 6d. per ton f.o.b. Liverpool and Leith. The Continent is not buying, and demand is consequently mainly for the Colonies, Spain, and Japan. There continues to be good inquiry for the second half of the year; but the ideas of buyers are not above £12 10s. per ton. f.o.b.; whereas makers are holding for £12 12s. 6d. to £12 15s. per ton. For near months spot prices are quoted, without business resulting.

Nitrate of Soda.

This article is quiet in all positions, and spot prices have been reduced to 10s. 10½d. and 11s. 1½d. per cwt., for ordinary and refined qualities respectively.

LONDON, *June* 17.

Tar Products.

Business has been rather quiet during the past week, doubtless owing to the Whitsuntide holidays. So far as benzol is concerned, there is very good demand, especially for early delivery. For prompt shipment 9d. has again been paid; while it is reported that there is a considerable inquiry from the Continent for delivery all over next year. The English aniline makers have lately been buying for June-July delivery; and the market has a decidedly healthy appearance. In 50-90 per cent., there are still buyers at 8½d. for forward delivery; but makers are not inclined to entertain business at this price. It is also reported that manufacturers in the North have had considerable inquiries for special qualities for gas enriching for export, which is rather a new feature in this market. There is practically nothing whatever doing in toluol; but there is still a very good inquiry, and the price may be taken as from 8d. to 8¼d. for prompt and forward delivery. In solvent naphtha, there is not very much doing for export; but there is still a fairly good demand for home consumption, although the quantities required do not appear to be large. The special heavy qualities are still selling freely, and there appears likely to be a good demand for same for some time to come. Business in creosote is still being done in Yorkshire at about 1⅜d. for really good makes; but some sales have been made of a salty quality in the Lancashire district at rather lower prices—makers being anxious to clear out stocks before the end of the half year. In London, the position remains unchanged as regards the largest producers; but the smaller distillers are still anxious to sell an inferior salty quality, for which they seem inclined to accept low prices. The demand for crude carbolic acid is scarcely so strong. Business is, however, reported at 1s. 9½d. in several instances for early delivery; while as regards forward, makers do not care to offer at existing prices, and are quoting 1s. 10d. to 1s. 10½d. In crystals, there is still a fairly good inquiry, but prices do not seem to improve. Pitch remains very quiet, and there is still a considerable quantity offering for early delivery both in London and in the Provinces. One or two parcels have lately been offered for shipment from London at under 30s., but without finding buyers; and even at lower prices it would be difficult to place any quantity. There is, however, rather a better inquiry for forward delivery; and it is reported that some quantity was sold for the first six months of next year at prices slightly better than those ruling for prompt. In the Yorkshire district, there is a little offering over the next two or three months, and makers as a rule ask 29s. to 29s. 6d. But for forward delivery there is very little doing; distillers probably not caring to commit themselves forward until some of the large tar contracts are settled for next season. In Lancashire, there are several small parcels offering for early delivery; but makers do not appear particularly anxious to contract forward, doubtless owing to the fact that most of the tar in this district is now let upon the sliding-scale. In South Wales, there is not much inquiry; business in briquettes being reported as very dull for both prompt and forward delivery. In Belgium, there have been several inquiries for delivery over the last six months of the year; but consumers ideas of value are very low indeed, and do not tempt manufacturers to contract.

The average values during the week were: Tar, 16s. 6d. to 21s. 6d. Pitch, London, 29s. to 29s. 6d.; east coast, 28s. to 29s.; west coast, 26s. 6d. to 27s. 6d. Benzol, 90 per cent., 9d.; 50-90 per cent., 8¼d. Toluol, 8¼d. Crude naphtha, 3¼d.; solvent naphtha, 8¼d. to 8½d.; heavy naphtha, 10d. to 10½d. Creosote, London, 1⅛d. to 1⅜d; North, 1¼d. to 1⅜d. Heavy oils, 2d. to 2 1/16d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 9⅝d. Refined naphthalene, £4 to £8; salts, 12s. 6d. to 14s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been very quiet during the past week, and there has not been much business doing. The nominal price at Beckton is still £12 16s. 3d. for June-July; but business does not appear possible at this figure. The South Metropolitan nominal price is still £13 for early delivery. Small sales were reported at Leith at £12 15s. There is, however, very little business doing at this port; buyers not appearing at all anxious to purchase. In Hull, one or two parcels have been sold at £12 10s. for prompt; but business here is decidedly quiet.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND IN ADDITION, 7,900,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Whit week in Lancashire is unexampled for the general cessation from all kinds of toil. The Coal Exchange last week was practically deserted; business being of the smallest dimensions.

Northern Coal Trade.

The coal trade is quiet; for though there is some increased shipment through the provision for holidays—the chief local ones being now near—yet the demand has been kept below that which is usual, the bright, hot weather lessening the consumption. In the steam coal trade, best Northumbrians are steady at about 9s. 6d. per ton, f.o.b.; second-class steams are from 8s. 3d. to 8s. 4½d., and steam smalls are 4s. 9d. to 5s. 6d. Some of the collieries are obliged to work short time. In the gas coal trade, the deliveries are now at their lowest point for the year. Some pits are only working short time; but the exports are fair, and collieries that export gas coals have a fair trade. The price for occasional cargoes varies from 7s. 9d. to 8s. 3d. per ton f.o.b., according to quality, with a higher quotation for one or two approved kinds. One or two contracts have been settled for export; and it is believed that the current basis has been about 14s. 10d. per ton at Genoa—a price that seems to point to the belief in a lower range of rates for freights in the later months of the year. Variation thus in freight obscures the price that is left for the coal at the pit. Coke is steady; and gas coke is less plentiful, so that the prices may be said to be kept up—about 12s. to 12s. 6d. per ton f.o.b. being quoted for good gas coke.

Scotch Coal Trade.

The market shows no change, certainly no improvement, as yet. With the settlement of the coal contracts for the Glasgow Corporation Gas Department, all the large orders for the season have been given. These contracts show how great is the scramble for orders, and, by reflex, the unsatisfactory position of the trade at the present moment. There may possibly arise a sense of freedom in the market, which has not been experienced while the large coal purchases were in progress; but as to that effect, if it should be felt, it will take a week or two to develop. So the prospect for the immediate future is not encouraging. The prices quoted are: Main 7s. 3s. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 9s., and splint 8s. 3d. to 8s. 9d. The shipments for the week amounted to 235,083 tons—a decrease of 8179 tons upon the preceding week, but an increase of 37,926 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,135,985 tons—an increase of 358,604 tons upon the same period of 1904.

Gas Explosion at Cape Town.—News reached London last Wednesday of a serious explosion at Cape Town on the preceding day. It appears that a quarter-of-a-mile of Adderley Street was blown up; and two people are known to have been killed, and a large number injured. The tramway lines, the telephone wires, and the water and gas mains were forced out of position. There were several smaller explosions of escaping gas, and the water from the burst mains flooded many houses. Later dispatches only tend to confirm the seriousness of the disaster.

Woman Poisoned by Gas in Dundee.—On the morning of Monday of last week, Mrs. Margaret Malcolm, a woman 61 years of age, was found dead in her house at No. 1, Seafield Road, Dundee. The discovery was made by a son of the deceased, who, on entering the house in the morning, was almost overpowered by the gas. His mother had been dead for some hours. She was in bed. The gas had not been properly turned off. It is stated that Mrs. Malcolm had been, on more than one occasion, spoken to by members of her family regarding her carelessness in turning off the gas.

The Local Government Board and Suction Gas-Producers.—At Uxbridge, last Tuesday, an inquiry was held into an application made to the Local Government Board by the Urban District Council for their sanction to a loan for steam engines, boilers, and pumps, &c., for the water-works; or, as an alternative, suction gas plant and an engine, which it was thought would be equally efficient for the power required —40-horse. The Inspector stated, however, that the Board would not sanction a loan for such plant, as they consider it is at present in an experimental stage.

Port Elizabeth Water Supply.—The Port Elizabeth Town Council have resolved that the Engineer's suggestion to increase the size of the Bulk River reservoir from 50 to 120 million gallons, at an additional cost of £6808, be carried out. The original depth was 45 feet, to the draw-off, and about 51 feet to the river bed; and now the proposed dam will be 69 feet high to the draw-off, and 76 feet to the bed. The Engineer has decided to introduce a curved dam in place of a gravity or straight dam; and by doing so, he will be able to utilize the round iron rods which come with the pipes, to reinforce the concrete, and thus reduce the sectional area.

Reductions in Price.—The South Molton Gas Committee have agreed to reduce the price of gas from 4s. 7d. to 4s. 2d. per 1000 cubic feet as from Sept. 1. The Accrington Gas and Water Board have decided to reduce the price of gas 2d. per 1000 cubic feet to consumers in their district, which comprises Accrington, Great Harwood, Rishton, Clayton-le-Moors, and Church. The reduction will come into force with the quarter commencing October next. The Montrose Gas Company announce a further reduction of 5d. per 1000 cubic feet in the price of gas used for engines (bringing it down to 3s. 6d.), to take effect from the last survey; while gas used for cookers has been reduced by 2d. per 1000 cubic feet.

No Drawing Stage.

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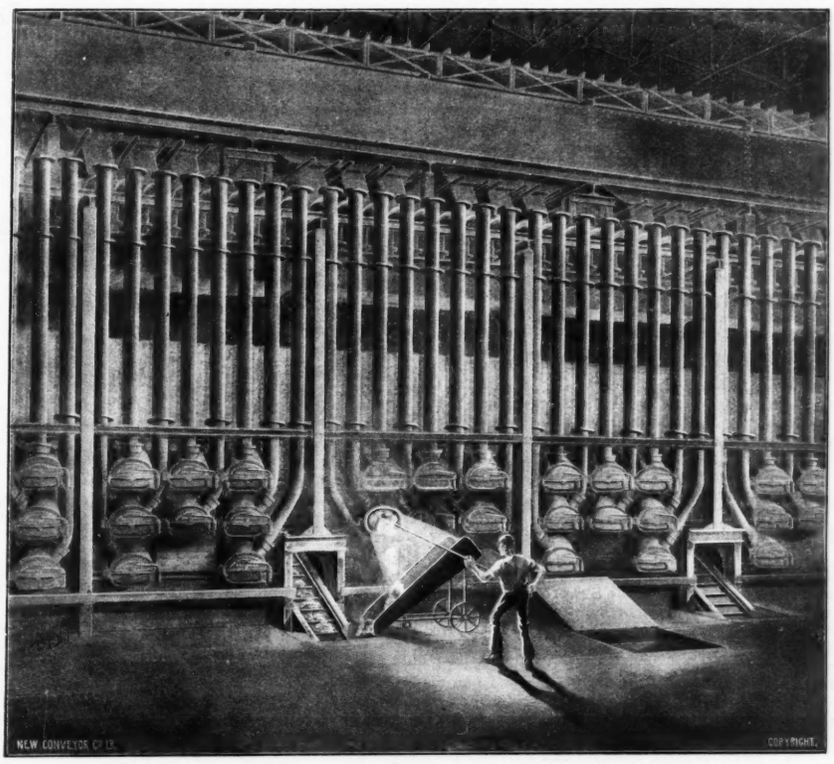

Producer Fed with Hot Coke.

PATENT "DWARF" INCLINED RETORT-BENCH.

NEW CONVEYOR CO., LTD., SMETHWICK.

Gas-Works Improvements at Neath.—The Neath Corporation are desirous of securing a loan of £8000 for improving the plant at the gas-works. At the Local Government Board inquiry, it was stated that the Gas Manager (Mr. R. A. Browning) had presented a report, in the course of which he said it was necessary that four new purifiers and a scrubber should be provided. The proposed extensions will take place on land belonging to the Corporation.

Supply of Water Gas at Stockport.—The decision of the Stockport Gas Committee to enlarge the capacity of their water-gas plant has met with some criticism at the hands of one or two members of the Council. Mr. Glitheroe, on the minutes of the Committee coming up for confirmation, protested against the proposal on the familiar ground that the gas was dangerous. He also argued that, as the water gas could be manufactured at 1s. 1½d. per 1000 cubic feet, there should be a reduction in the price of gas if the output was increased. Mr. Brewster, however, on the other hand, contended that the manufacture of cheap gas was a step in the right direction, and that it would lead to a reduction in price to the consumer. The minutes were adopted.

Final Meeting of the Rickmansworth Gas Company.—The Company held their final meeting last Wednesday, at the Town Hall, Rickmansworth, when the question of compensation to the Directors and officials was considered. The sum of £650 2s. 9d. was put aside for this purpose; and it was resolved to apportion the amount as follows: To the Directors, £350; to Mr. H. W. Fellows, who was Secretary for fifty years, £180 2s. 9d.; and to the Engineer and Manager (Mr. Henry Hill), £120. A word of praise was given to the latter gentleman for the able manner in which he had conducted the affairs of the Company for the past eleven years. In returning thanks, Mr. Hill said it was very pleasant to learn that at least in one place his efforts had been appreciated by those who employed him.

Tiverton Gas Undertaking.—Mr. J. Siddalls, in his tenth annual report on the financial working of the Tiverton gas undertaking, says the revenue account for the year shows a balance of income in excess of expenditure of £1437, which has been placed to the credit of the profit and loss account. On this account the standing charges for interest and sinking fund amounted to £1951; the balance (£514) has been taken from the reserve fund account, which now stands at £2234. The quantity of gas made during the year was 30,839,100 cubic feet. The gross profit made on the undertaking during the ten years it has been in the hands of the Corporation has been £16,839. Interest and instalments due on loans have accounted for £14,604 of this total, and the balance of £2235 is set aside as a reserve fund. The Manager (Mr. Clark Jeffery) in his report to the Council states that the make of gas per ton of coal for 1903-4 was 9760 cubic feet, compared with 11,402 cubic feet this year—an increase of 1642 cubic feet. The make of gas per ton for 1902-3 was only 8670 cubic feet.

Wantage Gas Supply.—According to the eleventh annual report on the gas undertaking recently submitted to the Wantage Urban District Council, there has been continuous improvement in the financial position of the works, which are under the supervision of Mr. Gordon Walker. In 1895, the balance in favour of the undertaking was only £282; in 1900 it was £892, being an average increase in value of something over £55 per year. This does not include the outlay for new retort-beds, new mains and services, and many other additions. In the balance-sheet for 1895, the total assets were £1068, while in the present balance-sheet they were £1605; being a difference of £537 in the eleven years. In moving the adoption of the report, Mr. Clements called attention to the principal variations from its predecessor. He said the balance last year was £145, and £50 of it was used for a new main, £40 for converting the lamps from ordinary to incandescent burners, and the remainder was placed to the good of the works. The Committee proposed to reduce the price of gas by 3d. per 1000 cubic feet as from July 1. The report was adopted.

Cleckheaton Gas Undertaking.—The annual report respecting the gas undertaking of the Cleckheaton District Council shows that during the year ending March 31 last there was a production of 101,552,000 cubic feet of gas, of which 96,615,100 cubic feet were accounted for by sales, street lighting, and use in public works. The percentage unaccounted for was 4·86, compared with 6·93 the previous year. The coal carbonized was 9310 tons, against 9707 tons in the year 1903-4; and the price averaged 10s. 3·86d. per ton, compared with 10s. 7·65d. The quantity of gas made per ton was 10,908 cubic feet, against 10,822 cubic feet the previous year. The coke sold was 4757 tons; and this, with 40 tons in store, was equal to 10 cwt. 2 qrs. 6 lbs. per ton of coal used, compared with 9 cwt. 0 qr. 1 lb. There was also a slight increase in the yield of tar and ammoniacal liquor. Altogether, the residuals realized £2965, or 61·72 per cent. of the cost of coal, against 58·81 per cent. before. Outstanding loans amounted to £28,100; and £904 7s. 5d. was paid in interest, and £1176 to the sinking fund. The gross profit amounted to £4742, against £4528. The total receipts were £16,317.

Sowerby Bridge and the Price of Gas to the Out-Districts.—On the recommendation of the Gas Committee, the Sowerby Bridge Urban District Council have rescinded all previous resolutions relating to the price of gas, and have agreed that as from April 1 last the rates shall be fixed as follows, less the present discounts: Sowerby Bridge district, 2s. 2d. per 1000 cubic feet. All outside districts supplied (including Luddenden Foot), 2s. 11d. per 1000 cubic feet. In moving the adoption of the Committee's minutes, Mr. Whiteley remarked that they had had many applications to supply cheaper gas for power purposes; but they found this would add to the cost of the gas by the complications they would have in extra outlay. Most of the places that supplied cheap gas for power purposes had a higher ordinary price than they had in Sowerby Bridge. The Committee, it would be seen, recommended that all the outside consumers should be put on the same level. This would do away with much criticism they had received from certain gas consumers who did not think it right that they should have to pay more for gas than some of their competitors who also took their supply from Sowerby Bridge. They were buying in the same market, and yet having to pay a higher price.

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Sizes
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Varieties.

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AGENCIES, SHOWROOMS AND DEPOTS: LONDON (City)—15, Upper Thames Street, E.C.; LONDON (West End)—23, Princes Street, Cavendish Square, W.; LIVERPOOL—30, Red Cross Street; MANCHESTER—24, Brazennose Street; BRISTOL—10, Victoria Street; NEWCASTLE-ON-TYNE — 13, Prudhoe Street; GLASGOW — 125, Buchanan Street; BIRMINGHAM—Guildhall Buildings, Stephenson Street; DUBLIN—44, Grafton Street; SOUTHAMPTON—Town Quay (The Old French Prison).

Shanklin Water Supply.—The auxiliary water supply to Shanklin (I.W.) from the springs at Chillerton and Luccombe has been producing some excitement among the members of the District Council. It was urged that the scheme ought to be considered by the ratepayers before asking the Local Government Board to sanction an expenditure of £10,000 for a yield of only 60,800 gallons per day; thus increasing the rates to the extent of 8½d. in the pound. On the other side, a belief was expressed that the yield would be at least 500,000 gallons per day, and that there would be an increase in the revenue of £727 per annum. The decision arrived at is that the Local Government Board's sanction is to be obtained to the scheme.

Accident to a Governor at Pontefract.—Owing to the snapping of a chain carrying the balance-weights of the governor connected with a new holder at the Pontefract Gas-Works, and the falling of the cone, the whole of the pressure was thrown upon the mains; the result being the blowing out of the water-seal in some of the old wet meters, and the escape of gas into the houses. The accident happened in the night, and a few of the inhabitants suffered inconvenience; but only one serious case occurred, and the person—an elderly lady—speedily recovered. As soon as the matter was brought to the notice of the Manager (Mr. L. V. Whitaker), he ordered a thorough examination of all the wet meters, and they were restored to proper working order. There was no interruption in the supply of gas.

Water Profits at Leeds.—The income of the Leeds Water Department for the past year was £157,230, and the expenditure £48,216—leaving a gross profit of £109,014. Of this, interest and income-tax absorbed £65,684, leaving a net profit of £43,330. From this had to be deducted £31,390, in respect of redemption fund charges, leaving a net surplus of £11,939, against £15,386 for the previous year. The profit has fallen short of the estimate by some £3000, partly owing to the larger rate of interest that has to be paid on money recently borrowed. In addition to this, a sum of £1000 was granted in respect to the scheme of afforestation in the Washburn Valley. Money had also to be paid on account of the Parliamentary Bill for the new water-works; and there was an increased payment both to the Leeds and outside rating authorities.

Suicides by Gas.—The list of persons who have chosen the inhaling of gas as a means of putting an end to their existence was added to last week at Hove by a retired telegraph clerk, whose mind seems to have become unhinged by the abuse of drink and drugs. The method employed by the deceased was the common one of placing the end of a gas-pipe in his mouth and covering up his head. In fact, his widow at the inquest suggested that the sad event might not have occurred if her husband had not read a newspaper report of a similar case. In a second instance, a lady named Southon, living at Wandsworth, who suffered from cancer, was found sitting at her scullery table dead. In her mouth was a gas-pipe leading from a bracket, and tied in position with a piece of tape. The unhappy woman had also taken the precaution of fastening herself down by means of a strap passed round her knees and over her shoulders. A letter was found indicating the intention of the deceased to destroy herself owing to the pain she suffered.

Cost of the Torpoint Water Bill.—The Bill of costs in connection with the promotion of the abortive Torpoint Water Bill has been presented to the District Council. It amounted to £6605; but of this total nearly £900 has been struck off on taxation, and the Bill comes in round figures to £5700. The payment of this large amount is likely to entail considerable hardship on the ratepayers of the district, in which a penny rate produces only from £36 to £40. Before the promotion of the Bill, negotiations had taken place between the District Council and the Admiralty and War Office, who would have become large customers and benefited considerably if the scheme had been carried out. Had the Bill become law, these Government departments, in addition to taking a stipulated and minimum quantity of water, would have paid a proportion of the cost of promotion. There does not appear, however, to be any provision in the agreement binding the Admiralty or the War Office to pay a share of the costs in the event of the promotion being unsuccessful.

Plymouth Water Supply and the Leat.—A report was presented to the Plymouth Town Council on Thursday last with reference to the recent experiment in supplying water to the town by means of the leat between the Burrator and Roborough reservoirs, instead of the 25-inch main. The Water Engineer (Mr. Howorth) stated on the day when the experiment was tried that there was leakage at the rate of 1,298,000 gallons per 24 hours; and he subsequently reported as the result of a 24 hours' test that the loss through leakage was 1,190,000 gallons. The Water Committee were of opinion that the leat between the two reservoirs was in serviceable condition for use in case of emergency, but that some of the worst sources of leakage should be stopped. Mr. Debnam, the Chairman of the Water Committee, thought it was very satisfactory to find that for 24 hours the town was supplied by the leat only. No complaint was made by the inhabitants as to the supply. The experiment showed that, in time of difficulty or accident, the subsidiary supply was equal to the town's demands.

Carlisle Town Councillors and the Geltsdale Water Scheme.—As the first contract in connection with the plans of the Carlisle Corporation for obtaining water from Geltsdale is now almost carried out, the Town Council have been considering a proposal that application should be made to Parliament for increased borrowing powers to the extent of £100,000, to permit of the completion of the scheme by the provision under a separate contract of a storage reservoir at Castlecarrock estimated to cost over £71,000. The present borrowing powers of the Corporation are £150,000; and it is hoped that the total cost of the work will come out at something near the estimate of £243,000. Mr. Nicholson said many councillors thought the Committee had agreed that before proceeding with the second contract they would finish off the first, and thus give the springs a trial. There was an opinion abroad that possibly the reservoir would not be required. The existence of any agreement not to proceed with the reservoir was denied; but after a long discussion, it was arranged that the proposal should stand over for a month.

SEASON 1905.

TAKING LINES WITH GAS COMPANIES.

The "MAIN"

Slot Cookers

15 DIFFERENT SIZES.

Specially Designed for Hiring.

New Summer List of Cookers, Grillers, &c., now ready. Supplies, with Gas Company's Name printed on, sent on application.

R. & A. MAIN, LIMITED,

LONDON AND GLASGOW

ALSO AT

FALKIRK, BIRMINGHAM, BRISTOL,
MANCHESTER, MELBOURNE, AND SYDNEY.

The General Incandescent Company, Limited, intimate that, from the 21st inst., their chief office will be removed to No. 52, Great Eastern Street, E.C.

The Colwyn Bay Urban District Council have placed an order with Messrs. R. Dempster and Sons for Waddell's patent regenerators, to take the place of existing regenerators of the Klonne type.

In the pass-list of the examinations in "Gas Manufacture" given in the "JOURNAL" last week, the name of H. M. Tylor was inadvertently printed in the second class of the Ordinary Grade for H. M. Tysoe. In the first-class list in the same grade, the name of F. H. White was given instead of F. H. While.

According to news recently received in Newcastle, the contracts for supplying the Brussels Gas-Works with from 80,000 to 110,000 tons of coal over the ensuing twelve months have just been allotted. With the exception of 15,000 tons ordered from Yorkshire, the tenders from the Durham coalfield have all been rejected; while those from Westphalia have been accepted. It is stated that this will be the first year that Durham coals have failed to find their way into Brussels.

Mr. W. Edgar, of the Blenheim Works, Hammersmith, has issued an abridged catalogue of his specialities in gas lamps, lanterns, and other appliances. It is very tastily got up, and is in convenient form for carrying in the pocket.

Last Friday, Lady Hardwicke, who was accompanied by Lord Hardwicke, distributed, at the Royal Horticultural Hall, Vincent Square, Westminster, the prizes gained at the Universal Cookery and Food Exhibition held at the hall early last month, and noticed in the "JOURNAL" at the time. There were in all 420 prize winners; but many of them were unable to be present. Mr. C. Herman Senn, the Hon. Director, said that in the strictest sense the exhibition was hardly an all-round advance upon its predecessors, mainly due to the small space available, and the inadequate representation in certain classes. Some of these—notably those devoted to housewives, domestic cooks, and chefs, left much to be desired. The standard of good all-round work done by the pupils attending cookery classes at the elementary schools was well maintained. The artisan and the household cookery exhibits were, with few exceptions, poor in quality and number.

WANTED, FOR SALE, CONTRACT, &c. ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

FITTERS AND SERVICE LAYERS. No. 4415.
FOREMAN. No. 4409.
GAS FITTER. Mitcham Gas Company.
INCANDESCENT BURNER MAINTENANCE. No. 4411.
MANAGER, GAS, WATER, OR ELECTRICITY WORKS IN INDIA. Mansfield and Sons, Liverpool.
MANAGER (Australia). No. 4410.
OUTDOOR SUPERINTENDENT. No. 4413.
STOKER TO TAKE CHARGE. No. 4408.

Situations Wanted.

DRAUGHTSMAN. No. 4414.
MANAGER. No. 4412.
SHOW-ROOM MANAGER AND SALESMAN. No 4407.

Plant, &c., for Sale.

PUMPING MACHINERY. Birmingham Water Department.
PURIFIERS, &c. Whitstable Gas Company.

Stocks and Shares.

ASCOT GAS COMPANY. June 27.
EAST SURREY WATER COMPANY. June 27.
HUNGERFORD GAS COMPANY. June 27.
LEATHERHEAD WATER COMPANY. June 22.
LOWESTOFT WATER AND GAS COMPANY. July 4.
MAIDENHEAD GAS COMPANY. June 27.
ROMFORD GAS COMPANY. July 4.
RUGBY GAS COMPANY. June 30.
SOHAM GAS COMPANY. June 27.
WHITCHURCH GAS COMPANY. June 27.
WOKING GAS COMPANY. June 27.

TENDERS FOR

Carbon.

HALIFAX GAS DEPARTMENT. Tenders by July 4.

Coal and Cannel.

BEVERLEY GAS DEPARTMENT. Tenders by June 28.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by June 24.
EXMOUTH GAS COMPANY. Tenders by June 30.
GAINSBOROUGH GAS DEPARTMENT. Tenders by June 27.
ILKESTON GAS DEPARTMENT. Tenders by July 1.
KNUTSFORD GAS AND WATER COMPANY. Tenders by June 24.
NEW MILLS GAS DEPARTMENT. Tenders by June 26.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by June 28.
ROMFORD GAS COMPANY. Tenders by July 6.
SEDGLEY GAS DEPARTMENT. Tenders by July 6.
ST. ANNE'S-ON-SEA GAS COMPANY. Tenders by June 28.
TEIGNMOUTH GAS DEPARTMENT. Tenders by June 22.

Coke.

ALDERSHOT GAS AND WATER COMPANY.

Fire Clay Goods.

PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.

General Stores, Paints, Oils, Tallow, &c.

PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.
SALFORD GAS DEPARTMENT. Tenders by July 6.

Incandescent Goods.

PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.

Iron and Steel and Castings.

PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.
SALFORD GAS DEPARTMENT. Tenders by July 6.

Lime.

HALIFAX GAS DEPARTMENT. Tenders by July 4.
PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.

Meters, &c.

PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.
SALFORD GAS DEPARTMENT. Tenders by July 6.

Oxide of Iron (New and Spent.)

HALIFAX GAS DEPARTMENT. Tenders by July 4.
NEW MILLS GAS DEPARTMENT. Tenders by June 26

Pipes, &c.

PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.
SALFORD GAS DEPARTMENT. Tenders by July 6.

Rubber Tubing, Yarn, &c.

SALFORD GAS DEPARTMENT. Tenders by July 5.

Scrubber Washer.

BANGOR (Co. DOWN) GAS DEPARTMENT. Tenders by June 27.

Sulphuric Acid, Brimstone, &c.

HALIFAX GAS DEPARTMENT. Tenders by July 4.

Tar and Liquor.

LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 26.
NEWARK GAS COMPANY. Tenders by June 24.
NEW MILLS GAS DEPARTMENT. Tenders by June 26.
READING GAS COMPANY. Tenders by June 26.
STRETFORD GAS DEPARTMENT. Tenders by July 10.
WILMSLOW, &c., GAS COMPANY. Tenders by June 26.

Valves, Ironmongery, Taps, Lead Piping, Pendants, Fittings, &c.

HALIFAX GAS DEPARTMENT. Tenders by July 4.
PONTYPRIDD GAS DEPARTMENT. Tenders by July 3.
SALFORD GAS DEPARTMENT. Tenders by July 6.

Weighing Machine Repair.

SALFORD GAS DEPARTMENT. Tenders by July 6.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 879.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14—15	..	5 0 0
200,000	5	May 12	6½	Bombay, Ltd.	6½—7	..	4 12 10
140,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 6
50,000	10	Mch. 15	14	Bourne- } 10 p.c.	29½—30½	..	4 11 10
251,810	10	,,	7	mouth Gas } B 7 p.c.	16½—17½	..	4 0 0
53,200	10	,,	6	and Water } Pref. 6 p.c.	15½—16½	..	3 12 9
380,000	Stk.	Feb. 24	12	Brentford Consolidated	247 - 252	..	4 15 3
300,000	,,	,,	9	Do. New	18 —190	..	4 14 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	127—132	..	3 15 9
206,250	,,	June 15	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
220,000	Stk.	Mch. 15	11	Brighton & Hove Orig.	225—230	..	4 15 8
246,320	,,	,,	8	Do. A. Ord. Stk.	165—170	..	4 14 2
460,000	20	Mch. 30	10	British	40 -41	..	4 17 7
100,000	Stk.	Feb. 24	6	Bromley, Ord. 5 p.c.	120—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	90—94	..	4 15 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd.	11⅞—12¼	..	5 14 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
150,000	20	Mch. 15	8¼	Cagliari, Ltd.	25—27	..	6 2 3
100,000	10	May 31	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Apl. 28	4½	Do. 4½ p c Pref.	9¾—10¼	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	101—103	..	4 7 5
1,400,000	Stk	Feb. 24	5⅛	Commercial 4 p.c Stk.	114—117	..	4 8 10
560,000	,,	,,	5	Do. 3½ p.c. do.	111—114	..	4 7 9
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	85—87*	+½	3 9 0
800,000	Stk.	,,	6	Continental Union, Ltd.	108—111*	..	5 8 1
200,000	,,	,,	7	Do. 7 p c Pref.	137—142*	+½	4 18 7
424,070	Stk.	Feb. 18	5½	Derby Con. Stk.	124—126	..	4 7 4
55,000	,,	June 3	4	Do. Deb. Stk.	108—110	..	3 12 9
486,090	10	Jan. 27	11	European, Ltd.	22—23	..	4 15 8
354,060	10	,,	11	Do. £7 10s. paid	15—16	..	5 3 2
15,243,200	Stk.	Feb. 10	4⅛	Gas- } 4 p.c. Ord.	99—100	—½	4 8 0
2,600,000	,,	,,	3½	light } 3½ p.c. max.	92—94	..	3 14 6
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	109—111	..	3 12 1
4,193 975	,,	June 15	3	Coke } 3 p.c. Con. Deb.	89—91*	+½	3 5 11
258,740	Stk.	Mch. 15	5	Hastings & St. L. 3½ p.c.	100—103	..	4 17 1
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	17—18	..	6 2 2
3,800,000	Stk.	May 12	10	Imperial Continental	211—214	—1	4 13 6
473,600	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Mch. 15	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
561,000	Stk.	Feb. 24	10	Liverpool United A	223—225	..	4 8 11
718,100	,,	,,	7	Do. do. B	165—167	..	4 3 10

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	Dec. 30	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	Dec. 15	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 17 1
541,920	20	May 31	3½	Monte Video, Ltd.	11—12	..	5 16 8
1,565,892	Stk.	Feb. 24	4½	Newc'tle & G'tesh'd Con.	108½—109½	—½	4 4 6
406,025	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	93—95	+1½	3 13 8
15,000	10	Feb. 24	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd.	143—148	..	5 8 1
600,000	5	Mch. 30	7	Ottoman, Ltd.	6—6¼	..	5 12 0
168,255	Stk.	—	6¼	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord.	5¼—6	—¼	5 0 0
796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	5⅝—5⅞	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
851,070	10	Apl. 28	7	River Plate Ord.	11¾—12¼	..	5 14 3
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
250,000	10	Apl. 13	7	San Paulo, Ltd.	12¾—13¼	..	5 5 8
70,000	50	Jan. 3	5	Do. 5 p.c. Deb.	52—54	..	4 12 7
135,000	Stk.	Mar. 15	10	Sheffield A	235—237	..	4 4 5
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,498	,,	,,	10	Do. C	235—237	..	4 4 5
123,998	Stk.	Mch. 30	5	Shrewsbury Ord. 5 p.c.	107—110	..	4 10 11
70,000	10	May 31	10	South African	15⅝—16⅞	..	6 1 3
6,250,000	Stk.	Feb. 10	5½	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,832,700	,,	Jan. 13	3	Do. 3 p.c. Deb.	90—92	..	3 5 3
575,000	Stk.	Feb. 24	5½	S'th Suburb'n Ord. 5 p.c.	121—124	..	4 8 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
112,533	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	130—135	..	3 14 1
502,310	Stk.	May 12	5	Southampton Ord.	107—110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 24	6¼	Tottenham } A 5 p.c.	125—128	..	4 17 8
338,020	,,	,,	4¼	and } B 3½ p.c.	98—101	..	4 14 1
125,000	,,	Dec. 15	4	Edmonton } 4 p.c. Deb.	107—110	..	3 12 9
182,380	10	June 15	8	Tuscan, Ltd.	9½—10*	..	8 0 0
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
30,000	Stk.	Feb. 24	7½	Wands- } A 5 p.c.	163—168	..	4 12 3
255,636	,,	,,	6¼	worth } B 3½ p.c.	135—140	..	4 9 3
60,000	,,	,,	5½	and } C 3½ p.c.	114—116	..	4 13 6
57,564	,,	Dec. 30	3	Putney } 3 p.c. Deb. Stk.	82—87	..	3 9 0
745,872	,,	Mch. 15	5	West Ham 5 p.c. Ord.	102—104	..	4 16 2
185,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
193,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	105—110	..	3 12 9

Prices marked * are "Ex div"

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
JOHN WM. O'NEILL,
Managing Director,
PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO, LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

THE KEITH LIGHT.

OVER 2000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.**
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd., HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BIGGS, WALL, & CO., 13, Cross Street, Finsbury, E.C. *Telegrams:* "RAGOUT," LONDON. *Telephone:* 273 CENTRAL.
CHARGING MACHINERY—See Advt. in last week's issue.
SATURATORS—See Advt. in this week's issue.
EXHAUSTING MACHINERY—See Advt. in next week's issue.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

SHOW-ROOM SALESMAN.

THE Vacancy advertised by the Bath Gaslight and Coke Company for the above HAS NOW BEEN FILLED, and applicants who have not been written to are THANKED, and will please accept this notification.

DRAUGHTSMAN requires Situation.
Large Experience in all kinds of Gas Plant; also quantities and estimates. Good References.
Address No. 4414, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION wanted as Manager of small Works. Well up in Manufacture and Distribution of Gas. Nine Years Experience as Manager. Age 32. Good Testimonials.
Address No. 4412, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, position as Show-Room Manager and Salesman, with Company opening new Show-Rooms preferred. Ten Years' practical Experience, and thorough knowledge of all latest and up-to-date Gas Appliances, both Cooking, Heating, Lighting, and new methods of pushing Business. Conversant with Accounts and General Routine of Gas Office. Applicant is willing to start at small Salary, with Commission on Increased Business. First-class Testimonials. Age 30. Single.
Address No. 4407, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FITTERS and Service Layers Wanted by Suburban Gas Company.
Apply, by letter, stating Age, Experience, Wages required, and enclosing two *copies* of Testimonials, to No. 4415, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Stoker capable of Taking sole Charge of a small Gas-Works. Must have held a similar position. Wages 22s. per week, with House, Coal, and Gas. Abstainer preferred.
Apply by letter, with References, to No. 4408, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Gas-Works in Australia (near Melbourne), making 8 Millions, a capable and well-educated young man as MANAGER.
None but those thoroughly experienced and fully qualified in all branches of Gas Manufacture, particularly the erection and working of Generator Settings, &c., need apply.
Married man and total abstainer preferred.
Applications, stating Age, Experience, and Salary required (House, Fuel, and Gas provided), enclosing *copies* only of recent Testimonials, to be sent to No. 4410, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

WANTED, a good reliable Gas-Fitter for Lighting Installation and interior work generally.
Apply, by letter, stating Age, Qualifications, and Wages required, to the SECRETARY, Mitcham and Wimbledon Gaslight Company, Mitcham, SURREY.

WANTED, a thoroughly competent man to undertake the Maintenance of Incandescent Burners. Must be conversant with all types of Burners and modern methods of Lighting.
Apply, stating Age, Qualifications, and Wages required, to No. 4411, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

INDIA.

WANTED, an Intelligent Young Man, capable of Taking Charge of Installations of Gas, Water, or Electricity, in all parts of India. Salary to commence at £24 per Month, *plus* Travelling Allowance. Bachelor preferred.
Apply, stating previous Experience, to MANSFIELD AND SONS, LIMITED, 20, Redcross Street, LIVERPOOL.

WANTED, an Energetic, Intelligent Young Man, of good address, to act as the OUTDOOR SUPERINTENDENT of a medium-sized Gas undertaking. He must be able to Interview and Advise Consumers as to the best method of using Gas, and to direct and control a large staff of Gas-Fitters, and Main and Service Layers.
Apply, by letter, stating Age, Experience, and Salary required, to No. 4413, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREMAN OF WORKS.

WANTED, a Reliable and Experienced Man as General Carbonizing and Works Foreman, for a Works producing 500 Millions per Annum. Must understand Regenerative Furnaces, Inclined Retorts, and Carburetted Water-Gas Plant, together with all Machinery as generally used in Gas-Works.
House, Coke, and Gas provided.
Apply, by letter, stating Age, Experience, and Wages required, and sending *copies* of Three References, to No. 4409, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OLD Meters Purchased. Wet or Dry, any size, in Truckloads only at per Ton. State quantity.
Also all kinds of Apparatus bought for Cash.
FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

FOR Sale, very cheap for immediate disposal, TWO PURIFIERS, 10 ft. by 5 ft. by 4 ft. deep, Complete.
Apply to SAMUEL WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

PURIFIERS FOR SALE, cheap, to make room: Four 12 feet square by 4 feet deep. Cover Plates in bad condition, other parts, including Grids, in fair condition; also one 6-inch Centre Valve (dry-faced) in good condition.
The whole or any porton will be sold.
Particulars of WM. WYVER, Works Manager, or ROBERT B. REEVES, Secretary, Gas Office, WHITSTABLE.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

ROBERT DEMPSTER & SONS, Ltd.,
Contractor for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

WATER-WORKS PUMPING-ENGINE FOR SALE.

MODERN Compound Surface Con- densing PUMPING-ENGINE and WELL-PUMPS for a depth of 200 feet. Engine Cylinders, 25 in. and 54 in. by 5 ft. Stroke; Pump 24 inches diameter.
STEEL RISING MAIN, with lowering Rods and Screws.
Further Particulars and Order to view to be obtained from the SECRETARY, Corporation Water Offices, BIRMINGHAM.

THE Stretford Gas Company are pre- pared to receive TENDERS for the surplus GAS TAR and AMMONIACAL LIQUOR produced at their Works (together or separately) for a period of One, Two, or Three Years, commencing July 1, 1905.
The Directors are prepared to make the Contract on the sliding-scale basis or otherwise.
Tenders to be sent in, addressed to the Chairman, endorsed "Tenders for Tar," &c., on or before Monday, July 10, 1905 (Twelve o'clock noon).
Form of Tender may be obtained from the Secretary.
The Directors do not bind themselves to accept the highest or any Tender.

BENJAMIN HAYNES,
Secretary.

Stretford, June 16, 1905.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to receive TENDERS for the supply of not exceeding 7000 Tons of COAL for use at the Gas-Works, Beverley, for periods of One and Two Years, at their option, from the 30th of September next, to be delivered as from time to time directed, and at the expense of the Contractors f.o.b. at Keadby, or at the Pits, or at the Railway Station, Beverley, according to Terms of Contract. The Coal to be of the best kind, well screened, free from Sulphur, Bats, Bind, Refuse, and Dirt, and to be weighed 21 cwts. to the Ton upon the Corporation machine.
Payments will be made from time to time so long as the Contractors shall duly fulfil the Contract.
The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide the Contract as they think fit.
Further Information and Forms of Tender may be obtained of the Gas Manager, Mr. F. W. Oldfield, at the Gas-Works, Beverley, and Tenders, endorsed "Tender for Coals," must be delivered at my Office not later than Ten a.m. on Wednesday, the 28th day of June, 1905.

J. WILLIS MILLS,
Town Clerk.

URBAN DISTRICT OF BANGOR, CO. DOWN.

THE Council of the above District are prepared to receive TENDERS for the Supply, Delivery, and Erection, at the Bangor Gas-Works, of a ROTARY SCRUBBER-WASHER, capable of dealing with 350,000 cubic feet of Gas per Twenty-four hours, including Extension to present Shafting for driving, 10-inch diameter Connections, Bye-Pass, and other Valves.
The Council will provide Foundations.
The apparatus to be connected up to existing Mains, which are 10 inches diameter, and left in complete working order to the satisfaction of the Gas Manager, Mr. B. Mitchell.
Tenders will be received by me not later than Twelve o'clock noon on Tuesday, June 27, 1905.
The person or firm whose Tender is accepted will be required to enter into a bond for the due performance of the Contract.
The lowest or any Tender not necessarily accepted.

JAMES MILLIKEN,
Town Clerk.

Town Hall, Bangor, Co. Down,
June 10, 1905.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council invite Tenders for the supply of the following STORES and MATERIALS, required during the Year ending June 30, 1906—

No. of Contract.
5—Fire Clay Goods, Lime, &c.
6—Iron Tubing, Fittings, &c.
7—Lead and Compo.
8—Iron and Steel.
9—Oils and Drysaltery.
10—Brass Fittings and Sundries.
11—Slot Fittings.
12—Dry Meters.
13—Main Taps and Locks.
14—Steam Valves.
15—Castings.
16—Incandescent Lighting Goods.
17—Ironmongery.

Forms of Tender and any Information required may be obtained from Mr. Edward Jones, Gas Engineer, Gas-Works, Treforest, near Pontypridd.
No Tenders other than those upon the Forms issued will be considered.
Sealed Tenders, endorsed "Tender No. ——," must be received by the undersigned on or before the 3rd of July, 1905.

J. COLENSO JONES,
Clerk to the Council.

District Council Offices,
Pontypridd, June 15, 1905.

COKE.

FOR delivery during June, July August, and September, in Parcels of 500 Tons more or less, delivered free on rail Tongham (L. & S.W. Rly.). Offers invited.
Conditions on application to the GENERAL MANAGER, Aldershot Gas and Water Company.

NEWARK GAS COMPANY.

TAR.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the LIQUOR and surplus TAR produced at their Works, f.o.r. Great Northern Railway or Midland Railway in Purchasers' Tank-Waggons, for One Year from the 1st of July, 1905.
Terms: Cash Monthly.
Separate Tenders, each marked on the outside "Tender for Tar or Liquor" as the case may be, to be sent in to the undersigned on or before June 24, 1905.
The Directors do not bind themselves to accept the highest or any Tender.

F. B. FOOTTIT,
Secretary.

June 13, 1905.

URBAN DISTRICT COUNCIL OF COLWYN BAY AND COLWYN.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of about 5000 Tons of screened GAS COAL, to be delivered free at Colwyn Bay Station during the Year commencing July 1, 1905, and ending June 30, 1906.
The Committee reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.
No Tender Forms supplied.
Tenders, endorsed "Coal," and addressed to the Chairman of the Gas Committee, to be sent in to the undersigned not later than June 24, 1905.

JNO. C. PENNINGTON,
Engineer and Manager.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the supply of: (1) BRASS LAMP FITTINGS, (2) BRASS MAIN COCKS and UNIONS, (3) OXIDE OF IRON, (4) SULPHURIC ACID, (5) LIME; and for the purchase of: (1) BRIMSTONE, (2) GAS CARBON, (3) SPENT OXIDE OF IRON, during the Twelve Months ending the 30th of June, 1906.
Forms of Tender and further Information may be obtained on application to Mr. J. Wilkinson, F.C.S., Engineer, Gas-Works, Halifax.
Tenders, properly endorsed, must be sent to the undersigned on or before Tuesday, the 4th of July, 1905.
The persons whose Tenders are accepted for the supply of the above-mentioned Articles will be required to observe the Fair Contracts Clauses adopted by the Corporation.

By order,
KEIGHLEY WALTON,
Town Clerk.

CORPORATION OF LOUGHBOROUGH.

(GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee invite Tenders for the surplus TAR and AMMONIACAL LIQUOR for Twelve Months, from July 1, 1905, to June 30, 1906.
Estimated amount of Tar, 600 Tons; Liquor 1000 Tons. The Contractor to state price for Liquor at 5° Twaddell and per ton extra for every ½° above 5°.
The Corporation to deliver both Tar and Liquor into Contractors' boats at the Derby Road Wharf, Loughborough.
Tenders to be endorsed "Tender for Tar and Liquor," and addressed and delivered to H. Perkins, Esq., Town Clerk, Town Hall, Loughborough, not later than the 26th of June.
The Committee do not bind themselves to accept the lowest or any Tender.

EDWARD ONIONS,
Engineer and Manager.

June 10, 1905.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

GENERAL STORES.

THE Gas Committee invite Tenders for the following MATERIAL, in such quantities as may be required during the Twelve Months ending the 31st of August, 1906:—

1.—Gas Meters.
2.—Iron and Steel.
3.—Cast-Iron Main Pipes and Connections.
4.—Iron Castings.
5.—Gas and Steam Tubing and sundry Fittings.
6.—Gun-Metal Meter Taps and Keys, Pillar, and Bracket Taps.
7.—Brass Fittings for Meters.
8.—Lead Pipe, Block Tin, Tubing and Pendants.
9.—Ropes, Tarred and Spun Yarn, and Twine.
10.—Oils and Tallow.
11.—Paints.
12.—Brushes.
13.—India-Rubber Tubing, Sheeting, &c.
14.—Timber.
15.—Testing and Repairing of Weighing Machines.

Forms of Tender and all Information may be obtained and samples seen on application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Stores," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 6th of July, 1905.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
July 14, 1905.

ST. ANNES-ON-THE-SEA GAS COMPANY.

TENDERS are invited for the supply of 5000 Tons of best screened GAS COAL, to be delivered as required during the Year ending June 30, 1906.
Tenders to be sent in not later than June 28, 1905.
No Special Form of Tender provided.
The Directors reserve to themselves the right to divide the quantity into two Contracts, and do not bind themselves to accept the lowest or any Tender.

WILLIAM H. NUTTER,
Secretary and Manager.

Gas Offices, St Annes-on-the-Sea,
June 14, 1905.

GAINSBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the supply of 6000 Tons of best GAS COAL (screened, unscreened, and nuts), to be delivered at the Great Central Railway Station, Gainsborough, between the 1st of July, 1905, and the 30th of June, 1906, in such quantities monthly as may be required.
Sealed Tenders, endorsed "Tender for Gas Coal," giving full Particulars of the Coal offered, to be addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 27th inst.
No Special Form of Tender issued.
The Committee do not bind themselves to accept the lowest or any Tender.

JOHN BALDWIN,
Manager.

Gas-Works, Gainsborough,
June 10, 1905.

ROMFORD GAS AND COKE COMPANY, LIMITED.

THE Directors of the Romford Gas and Coke Company, Limited, invite TENDERS for the supply of 4000 Tons of best Durham GAS COALS (screened or unscreened), to be delivered in quantities as per Schedule herewith, viz.:—

Oct., 1905	500 Tons	March, 1906	400 Tons
Nov., ,,	600 ,,	April, ,,	400 ,,
Dec., ,,	600 ,,	May, ,,	300 ,,
Jan., 1906	500 ,,	June, ,,	300 ,,
Feb., ,,	400 ,,		

and to weigh 20 cwt. to the Ton over the Gas Company's weighbridge.
The coal is to be Fresh Wrought, Dry, and free from Dirt, Shale, and Pyrites.
Sealed Tenders, endorsed "Tender for Coal," and addressed to Jos. Smith, Esq., J.P., Chairman of the Company, are to be sent in not later than Thursday, July 6, 1905.
The Directors do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not supplied,

W. D. CHILD,
Engineer and Manager.

Works and Office, Nursery Walk,
Romford, June 19, 1905.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS for the supply of 4500 to 5000 Tons of best GAS COAL (screened or unscreened), to be delivered in such quantities and at such times as may be required from the 1st of August, 1905, to the 31st of July, 1906, and to weigh 20 cwt. to the Ton over the Gas Company's or Dock Company's weighbridge (the said machines are regularly inspected by the Officer under Weight and Measures Act). The Coal to be fresh wrought, dry, and free from Hards, Smudge, Dirt, Shale, and Pyrites.
Tenders to be accompanied by practical working Analysis.
Prices may be quoted c.i.f. or f.o.b. Exmouth Docks (by sailing vessels only), or f.o.r. Exmouth Railway Station (L. & S.W. Railway).
Sealed Tenders, endorsed "Tenders for Coal," to be addressed J. Palmer, Esq., Chairman, and delivered to the undersigned not later than Friday, the 30th day of June, 1905.
The Directors do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not supplied.

JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,
June 6, 1905.

NEW MILLS URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL, CANNEL, and OXIDE OF IRON.
TENDERS FOR TAR and AMMONIACAL LIQUOR.

COAL.

THE New Mills Urban District Council invite TENDERS for the supply of 2300 Tons of Best Gas Coal and 350 Tons of Cannel, for the Year ending the 30th of June, 1906.

OXIDE OF IRON.

Also for the supply of about 40 Tons of Oxide of Iron, to be delivered at the Midland Railway Station, New Mills.

TAR AND LIQUOR.

Tenders are invited for the surplus Tar and Ammoniacal Liquor produced at their Works from July 1, 1905, to June 30, 1906, to be delivered in purchasers' Tank-Waggons at the Midland Railway Station, New Mills.
Forms of Tender and full Particulars may be had on application to the Gas Manager.
The Council do not bind themselves to accept the lowest or any Tender.
Tenders, endorsed, to be sent to me so as to arrive not later than the 26th day of June, 1905.

By order,
JOSEPH POLLITT,
Clerk.

Town Hall, New Mills,
June 10, 1905.

THE Knutsford Light and Water Company invite TENDERS for about 3000 Tons of best GAS COAL and 300 Tons of CANNEL for the ensuing Twelve Months.

Tenders to be sent in on or before the 24th inst. and addressed to the Chairman of the Company.

The Directors do not bind themselves to accept the lowest or any Tender.

CORPORATION OF ILKESTON.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for 10,000 Tons of GAS COAL, NUTS, or CANNEL, to be delivered as required at the Gas-Works Siding (Midland Railway).

Forms of Tender supplied on Application. Such Forms only may be sent in, Sealed and endorsed, to Wright Lissett, Esq., Town Clerk, not later than July 1, 1905.

The Committee do not pledge themselves to accept the lowest or any Tender, and reserve their right to divide the quantity.

F. C. HUMPHRYS,
Engineer and Manager.

Gas-Works, Ilkeston,
June 15, 1905.

TO COAL CONTRACTORS AND OTHERS.

THE Sedgley Urban District Council invite TENDERS for supplying 700 to 1000 Tons of GAS COAL; the deliveries to be made at the Shut End siding, at such times and in such quantities as may be directed.

It is desirable that a statement of an analysis of the quality of a sample of the Coal to be supplied be sent with the Tender.

Sealed Tenders, marked "Coal," must reach me on or before the 6th of July, 1905.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
JOSEPH SMITH,
Clerk to the Council.

Offices: High Holborn, Sedgley,
June 12, 1905.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council invite TENDERS for the supply of 2800 Tons of best Durham or other good GAS COAL, screened or unscreened. Same to be supplied to the requirements of the Council between the 31st day of July, 1905, and the 30th day of June, 1906. The Coal must be fresh-wrought, and free from all impurities.

No special Tender Form will be issued.

Tenders must be accompanied by a full description and practical working Analysis of the Coals quoted, and may be f.o.b., c.i.f., Teignmouth Harbour, or f.o.r., Teignmouth Railway Station.

Sealed Tenders, endorsed "Gas Coals," to be sent to the undersigned not later than Thursday, the 22nd day of June, 1905.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
J. ALEX. GRAY,
Gas Manager.

READING GAS COMPANY.

THE Directors of the Reading Gas Company invite TENDERS for the purchase of their surplus TAR for One Year, commencing on the 1st of July next.

Specifications for the Contract will be forwarded on application to the Engineer and Manager, Mr. Douglas H. Helps, Assoc.M.Inst.C.E.

Under the Conditions of the Contract, no allowance will be made for any water which may be found in the Tar.

Railway communication direct to the works.

Tenders, endorsed "Tender for Tar," and addressed to the undersigned, must be delivered not later than Monday, June 26, 1905.

A. CANNING WILLIAMS,
Secretary.

159, Friar Street, Reading,
June 6, 1905.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR produced at their Works from July 1, 1905, to June 30, 1906.

Estimated quantities: Tar, 250 Tons; Liquor, 500 Tons.

Further Particulars may be had on application to the undersigned.

Sealed Tenders, endorsed "Tar" or "Tar and Liquor," and addressed to W. H. Welsh, Esq., 52, Brown Street, Manchester, must be sent in not later than Monday, the 26th day of June, 1905.

WM. SEVERS,
Engineer and Manager.

Gas-Works, Wilmslow,
May 31, 1905.

PATENTS, DESIGNS, AND TRADE MARKS ACTS, 1883 TO 1902.

NOTICE is Hereby Given, that METERS LIMITED, of 6, Mawson Chambers, Deansgate, Manchester, JOSEPH BRADDOCK, of 72, Windsor Road, Oldham, Lancashire, and WALTER MARTIN MUSGRAVE, of "Ashleigh," Heaton, Bolton, Lancashire, seek LEAVE TO AMEND THE SPECIFICATION OF LETTERS PATENT No. 15,740 of 1893, granted to Daniel Orme for "Improvements in and applicable to Prepayment Gas Meters."

Particulars of the proposed Amendment were set forth in the "Illustrated Official Journal (Patents)" issued on the 15th of June, 1905.

Any person or persons may give NOTICE OF OPPOSITION to the Amendment (on Form "G") at the Patent Office, 25, Southampton Buildings, London, W.C., within One Calendar Month from the date of the said "Journal."

C. N. DALTON,
Comptroller-General.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for a Twelve Months' supply of GAS COAL.

Particulars may be obtained from the undersigned, by whom Tenders will be received until Wednesday, the 28th inst.

JAMES BRADDOCK,
Manager and Secretary.

Gas Offices, Radcliffe,
June 14, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
MAIDENHEAD GAS COMPANY.

NEW ISSUE OF £4000 ADDITIONAL CONSOLIDATED ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C. on Tuesday, June 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WOKING DISTRICT GAS COMPANY, LIMITED.

NEW ISSUE OF 760 £5 SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WATER AND GAS SHARES
IN THE
EAST SURREY WATER COMPANY.
ASCOT DISTRICT GAS COMPANY.
WHITCHURCH AND DISTRICT (HANTS) GAS COMPANY, LIMITED,
HUNGERFORD GAS COMPANY, LIMITED.
SOHAM GAS COMPANY, LIMITED.
TO BE SOLD BY AUCTION, BY

MR. ALFRED RICHARDS, at the Mart, E.C., on Tuesday, June 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ROMFORD GAS AND COKE COMPANY, LIMITED.

NEW ISSUE OF 1000 £5 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 4, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES,

Ranking for a Maximum Dividend of 7 per cent., previous Issues of similar Shares now receiving 5¼ per cent.; also

£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 4, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LEATHERHEAD AND DISTRICT WATER-WORKS COMPANY.

NOTICE is Hereby Given of Sale by TENDER of 400 SHARES of £10 EACH (with dividend thereon limited to 7 per cent.) being a portion of the Additional Share Capital authorized to be raised by a Resolution passed at the General Meeting of Proprietors held on the 29th of October, 1903, in pursuance of the powers of "The Leatherhead and District Water Order, 1903."

No Tender will be received after Eleven a.m. on Thursday, June 22, 1905, nor below £14 per Share.

Form of Tender can be obtained on application to the Secretary.

By order,
JOHN YOUNG,
Secretary.

North Street,
Leatherhead,
May 31, 1905

RUGBY GAS COMPANY.
(INCORPORATED BY THE RUGBY GAS ACT, 1882.)

130 SHARES OF £10 EACH
(Additional Capital) or such less number as shall be declared at the time of Sale.
TO BE SOLD BY AUCTION BY

MR. JOHN R. TAIT (of the firm of TAIT, SONS, AND PALLANT), at the Royal George Hotel, in Rugby, on Friday, June 30, 1905, at Four o'clock in the Afternoon precisely, by order of the Company (under the provisions of the Rugby Gas Act, 1882), in Lots of Five Shares each.

The above Shares are part of the authorized additional capital of the Company and bear the standard dividend of 7 per cent. subject, under the sliding-scale, to increase or diminution with the price charged for gas.

The present price of gas admits of an estimated dividend on these Shares of £10½ per cent. per annum.

The dividend on the original capital of the Company for the past three years has been £13 per cent. per annum, and the present price of gas admits of an estimated dividend of £13½ per cent. per annum.

Particulars and Conditions of Sale, now ready, may be obtained at the OFFICES OF THE COMPANY, Railway Terrace, in RUGBY; of the AUCTIONEER, 2, Albert Street, RUGBY; or from

Messrs. WRATISLAW AND THOMPSON,
1, Regent Street, RUGBY,
Solicitors to the Company.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 16th inst., and RE-OPENED on the 1st of July, 1905.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

63, Chancery Lane, W.C.,
June 15, 1905.

Now Ready, pp. 584 and XVI. 251 Illustrations. F'Cap. Quarto, Price 18s. net (Post Free).

THE SEVENTH EDITION OF

NEWBIGGING'S HANDBOOK

FOR

GAS ENGINEERS AND MANAGERS

(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.

In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the Value of the book as a Work of Reference.

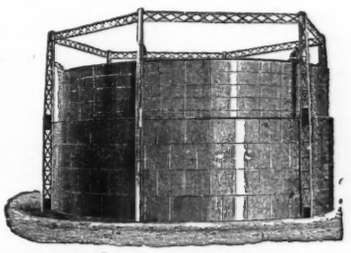
Orders may be sent through any Bookseller, or direct to the Publisher,

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

J. FIRTH BLAKELEY & Co.

THORNHILL,

DEWSBURY.



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A SPECIALITY.

References and Catalogues on application.

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FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

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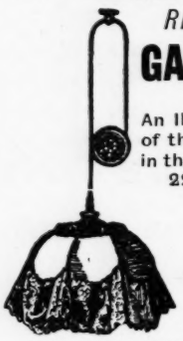
Telegrams: "Temperature London." Tel. No. 12,455 Central.

GREEN & BOULDING, — LIMITED, — 28, New Bridge St., LONDON, E.C.

THE "HANWELL" PATENT
Rising and Falling
GAS PENDANT



An Illustrated Description of this Pendant appeared in the "Journal" for Nov. 22, 1904 (page 599).

Write for full Particulars to the "HANWELL" Pendant Company,

96, ABINGTON STREET, NORTHAMPTON.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

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16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

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Telephone 1806.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

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THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

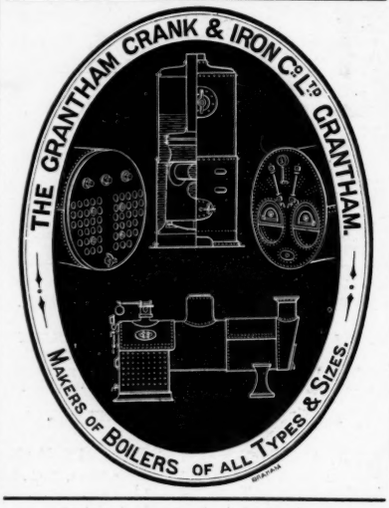
Gas Companies are solicited to try Samples of the
MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Prices and analysis on application.

The MIRFIELD (GAS-COAL) COLLIERIES CO., RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.



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New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

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MIDLAND WORKS,
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Efficiency Demonstrated.
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Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

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more Imperial Cookers sold in 1904 than in previous Year.

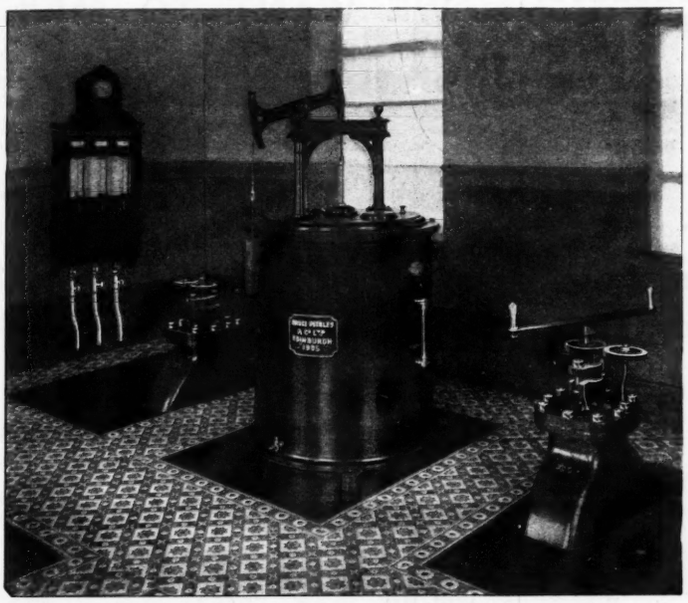
QUALITY WILL TELL.
COMPARE OUR PRICES.

OLD TOWN FOUNDRY, LEAMINGTON.

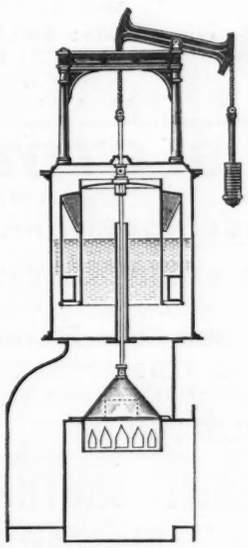
PATENT

SAFETY STATION GOVERNORS.

These Governors are the result of many years' varied experience in their design and manufacture, and they effectually Control Pressure in the Mains under the most exacting conditions.



From a Photo. of 30-inch Station Governor supplied to Aberdeen Corporation.



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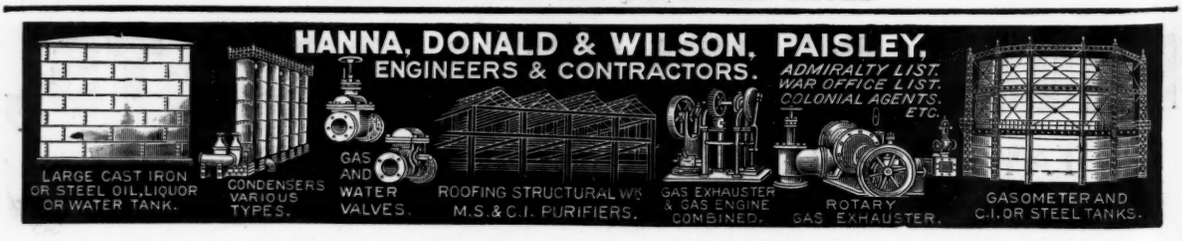
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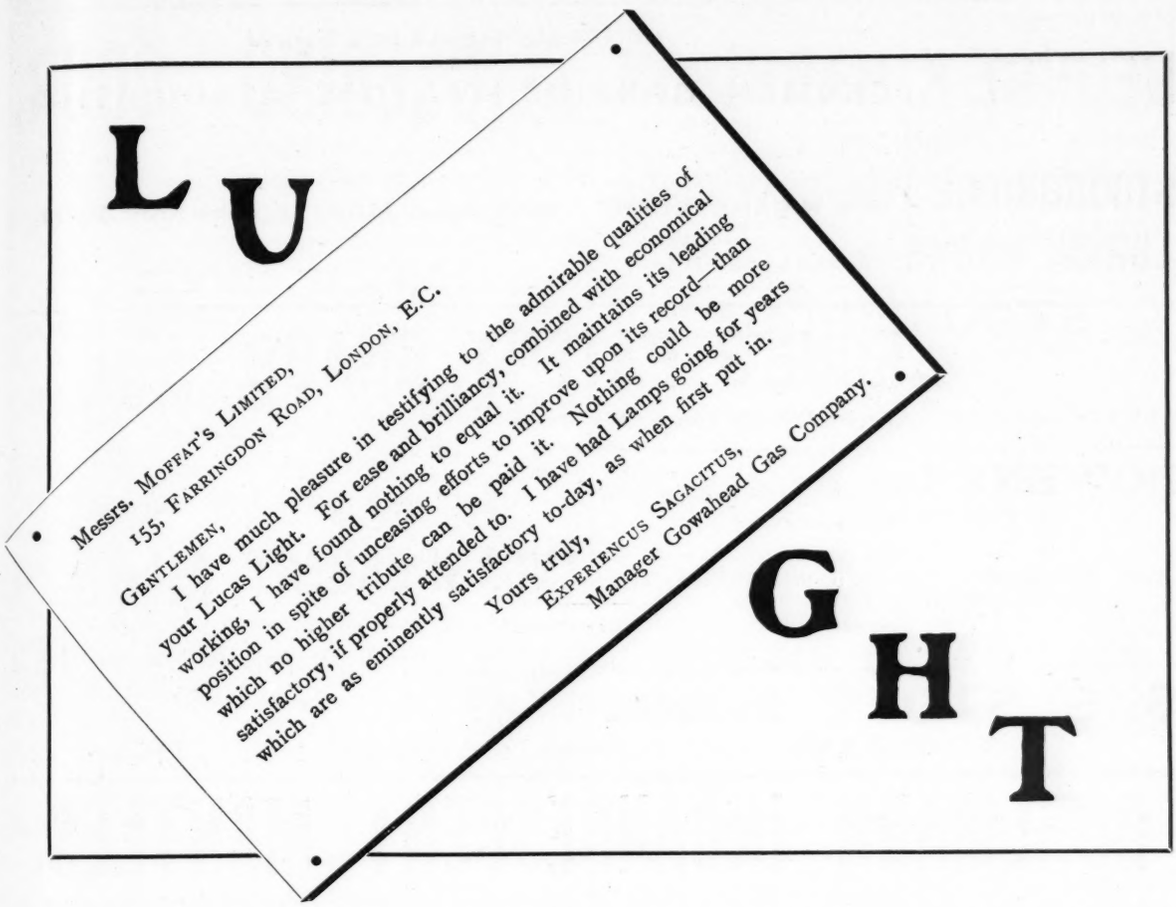
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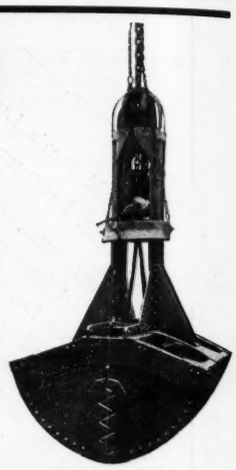

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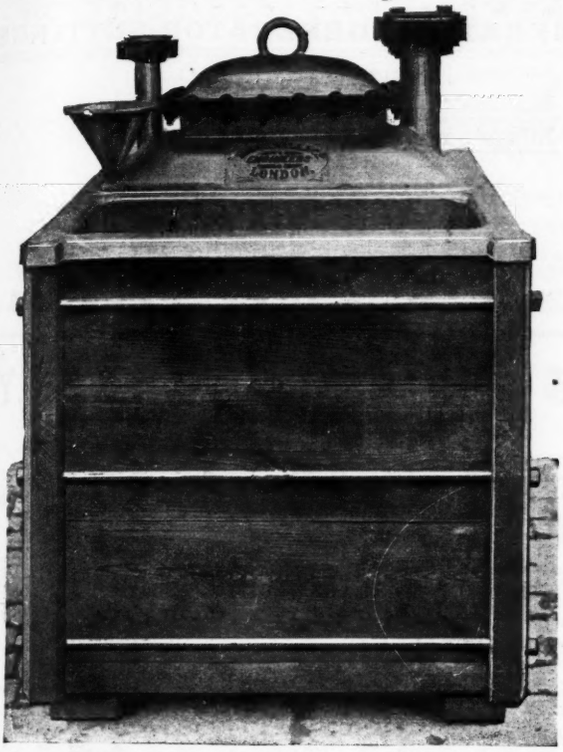

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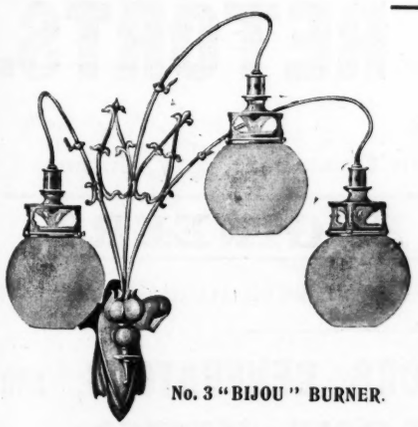

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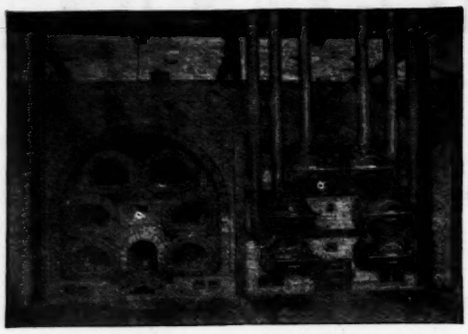

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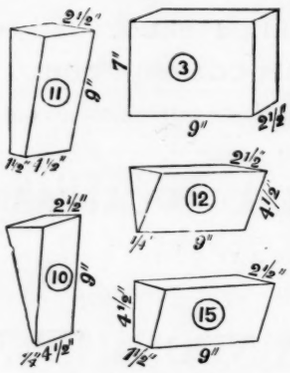

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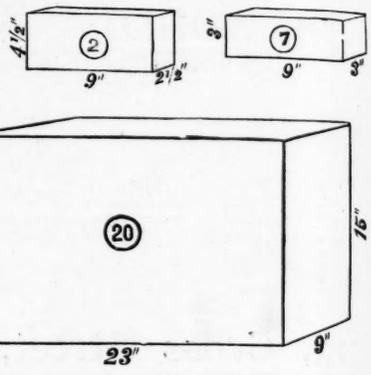

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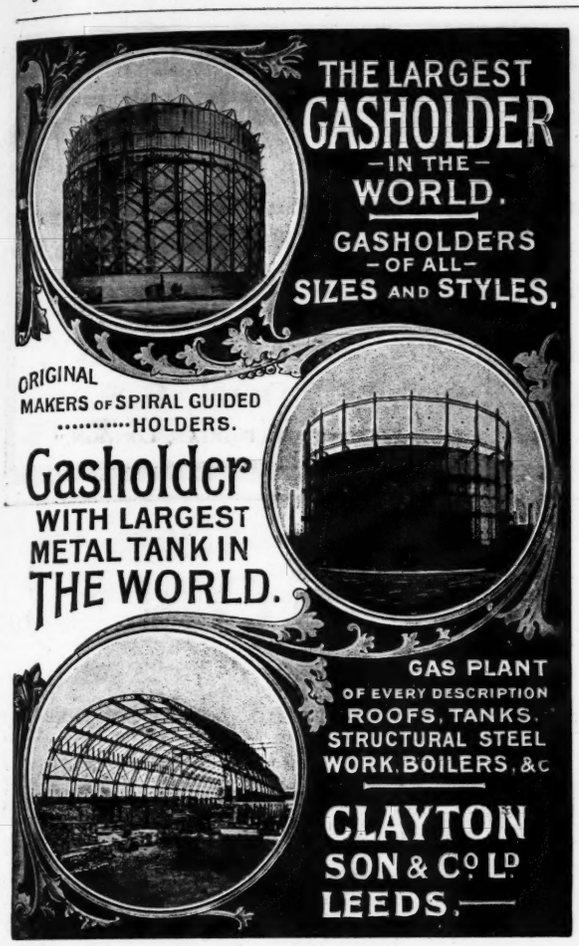

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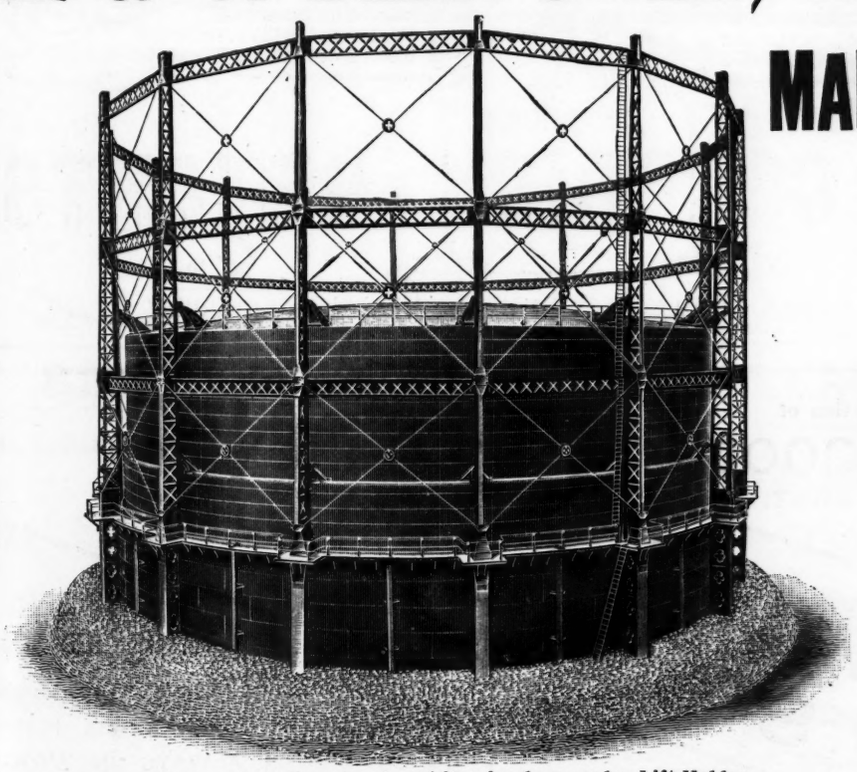

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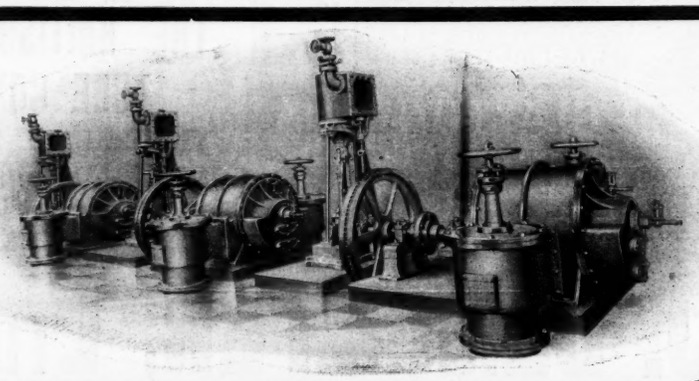

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